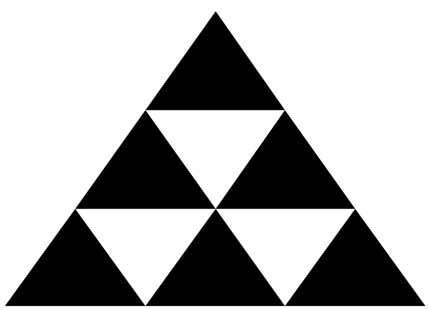
TIPS4RM

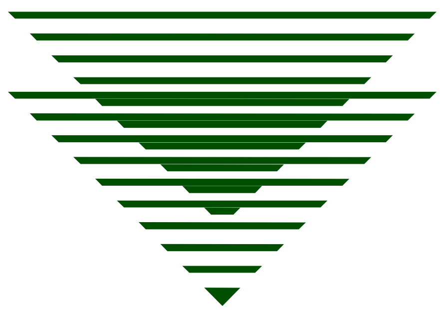
Targeted Implementation
and Planning Supports for
Revised Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Course: Grade 10 Applied Mathematics (MFM2P)

Unit 1: Similar Triangles





Dufferin-Peel
Catholic District
School Board

Student

REVISED

January 2009

Unit 1

Similar Triangles

1.1.1 It's All About Me

The last math course that I took was __________________

The mark I received in that course was __________.

The things I like most about math are __________________________________
____
____

The things I don't enjoy about math are ________________________________
____
____

I am taking this course because ______________________________________
____

I hope to achieve a mark of ______ %. I am going to achieve this mark by doing the following:
____
____

After school, I'm involved in (fill in the chart):

Activity	Description	Time per week
Job		
Sport/Club		
Other		

I would prefer to sit _________________________ because ________________
____

If you need to call home, you should speak to ___________________ who is my _________________ because _______________________________________
____

You should know that I have (allergies, epilepsy, diabetes,…) _______________
____

Some other things you should know about me ___________________________
____
____

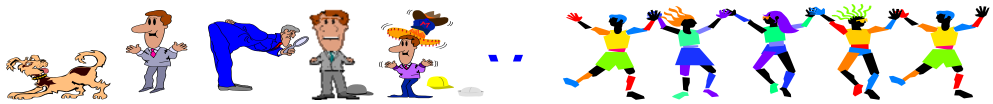
In 10 years I hope to ____
____

1.1.2 What's on the Menu?

<u>Teachers vs. Students</u>

(Adapted from About Teaching Mathematics by Marilyn Burns, Math Solutions Publications, 2000)

Who will win the tug of war in round 3?



Round 1: On one side are four teachers, each of equal strength. On the other side are five students, each of equal strength. The result is dead even.

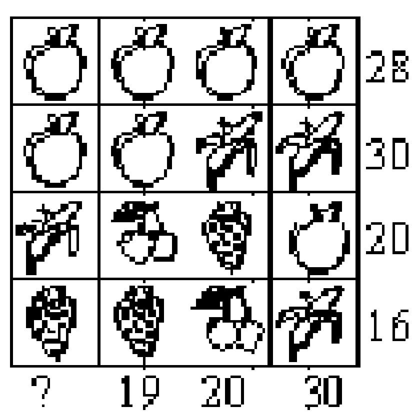
Round 2: On one side is Buddy, a dog. Buddy is put up against two of the students and one teacher. The result, once again is dead even.

Round 3: Buddy and three of the students are on one side and the four teachers are on the other side.

Who do you think will win the third round? Explain.

<u>Puzzling Fruit</u>

In the puzzle below, the numbers alongside each column and row are the total of the values of the symbols within each column and row. What should replace the question mark? Make sure you provide a full and detailed solution.

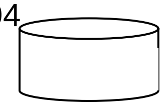


1.1.3 What's on the Menu? (Continued)

Buddy's Hungry!

Buddy, one of the teacher's dogs, is very hungry. Ms. Jones stops at the pet store on her way home from school. She is always looking for the most economical buy. While at the pet store, she notices the following prices of pet food:

Five 150 mL cans of *Perfect Pet* dog food for $1.26
Twelve 400 mL cans of *Doggies Love It* for $7.38
Ten 150 mL cans of *Rover's Chow* for $2.60
Six 400 mL cans of *Man's Best Friend* for $3.94



Which pet food should Ms. Jones buy? Explain in as many different ways as possible.

1.2.2: Review of Metric Length Units

Complete the following:

1. Fill in the blanks below with the correct number.

   a) 1 m = ______mm b) 1 m = _______cm c) 1 cm = ______mm

   d) 1 km = ______m

2. Convert each given measurement to the unit specified.

   a) 4.5 m = ______mm b) 5.3 m = ______cm c) 25.8 cm = ______mm

   d) 36.8 km = ______m e) 5694 m = ______km f) 2.5 mm = ______cm

3. The diameter of a golf ball is about 4 cm. What is the radius of the ball in millimetres?

4. Fill in the blanks with the correct units

   a) 8 m = 8000_____

   b) 500 mm = 50_____

   c) 85____= 8500 cm

1.2.3 Metric Funsheet!

Complete the following conversion worksheets.

1. 1000 mL = _______ L	2. 120 mm = _______ cm	3. 1200 mL = _______ L
4. 2 cm = _______ mm	5. 11000 L = _______ kL	6. 10 cL = _______ mL
7. 12000 m = _______ km	8. 8 g = _______ cg	9. 80 ml = _______ cl
10. 3 L = _______ cL	11. 2000 L = _______ kL	12. 5 cm = _______ mm
13. 900 cm = _______ m	14. 11 cg = _______ mg	15. 9000 m = _______ km
16. 7000 mL = _______ L	17. 5 kg = _______ g	18. 60 mm = _______ cm
19. 1 kg = _______ g	20. 4000 mL = _______ L	21. 1 cL = _______ mL
22. 1100 cL = _______ L	23. 10000 g = _______ kg	24. 2000 mL = _______ L
25. 7000 L = _______ kL	26. 70 ml = _______ cL	27. 5 g = _______ cg
28. 9 cL = _______ mL	29. 1 g = _______ cg	30. 8 kg = _______ g
31. 6 g = _______ cg	32. 6 km = _______ m	33. 30 mg = _______ cg

1.2.3 Metric Funsheet! (Continued)

1.) 3 metres = ______ centimetres

2.) 40 litres = ______ dekalitres

3.) 600 milligrams = _______ grams

4.) 5 kilometres = __________ hectometres

5.) 70 centimetres = _________ metres

6.) 900 decilitres= _______ dekalitres

7.) John's pet python measured 600 centimetres long. How many metres long was the snake?

8.) Faith weighed 5 kilograms at birth. How many grams did she weigh?

9.) Jessica drank 4 litres of tea today. How many decilitres did she drink?

10.) Fill in the blanks with the correct units

a) 10 km = 10000_____

b) 50000 mm = 50_____

c) 85____= 8500 cm

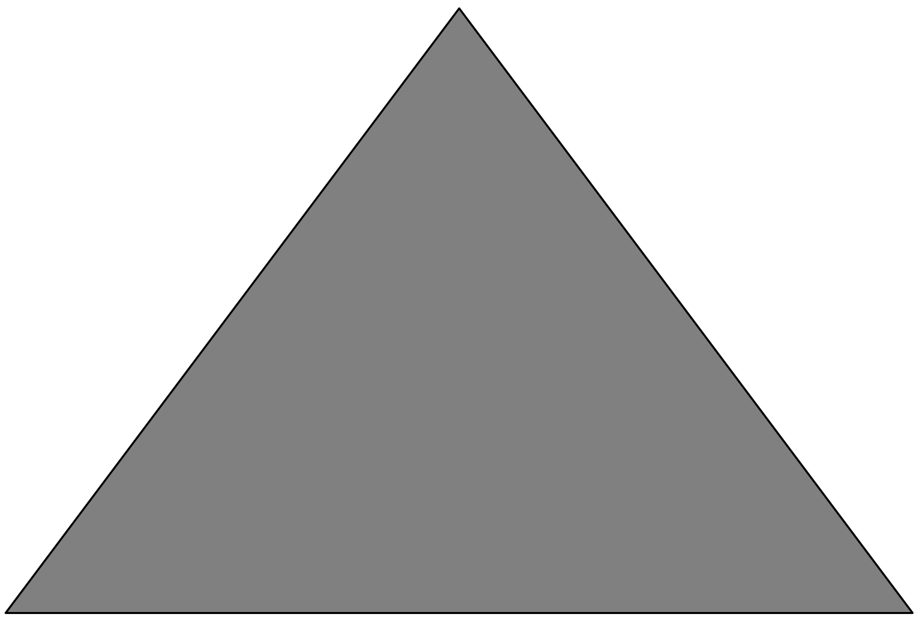
1.2.4 What's on the Menu?

Growing Shapes

Materials Needed: Ruler
Problem: For the triangle drawn below, make another triangle that has exactly the same shape and whose:

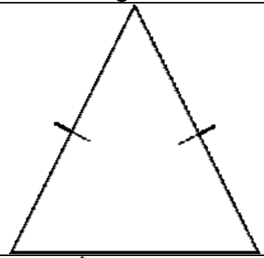
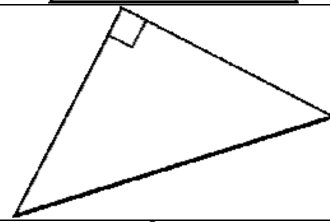
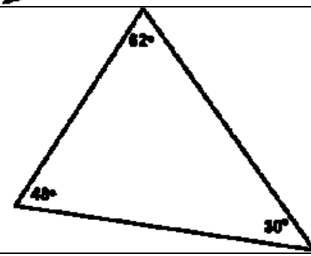
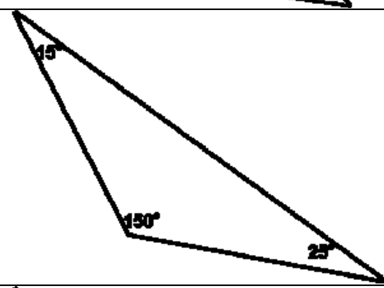
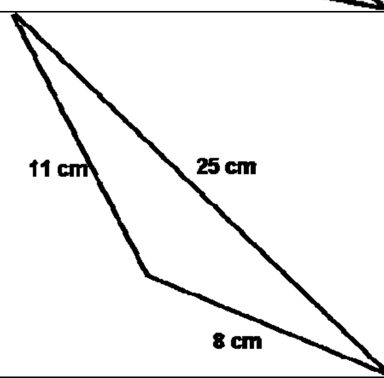
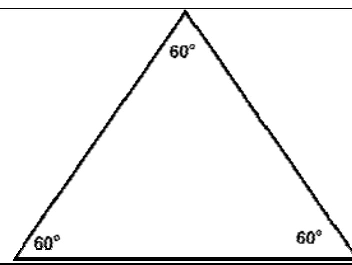
a) Perimeter is twice as long.
b) Perimeter is half as long.
c) Determine the area of the three triangles (original, double, half)
d) Determine the relationship between the side length and the area of the triangle. For example, what happens to the area when side length is doubled?

Show your work and reasoning in each case



1.3.1 “Tri” Matching These Triangles

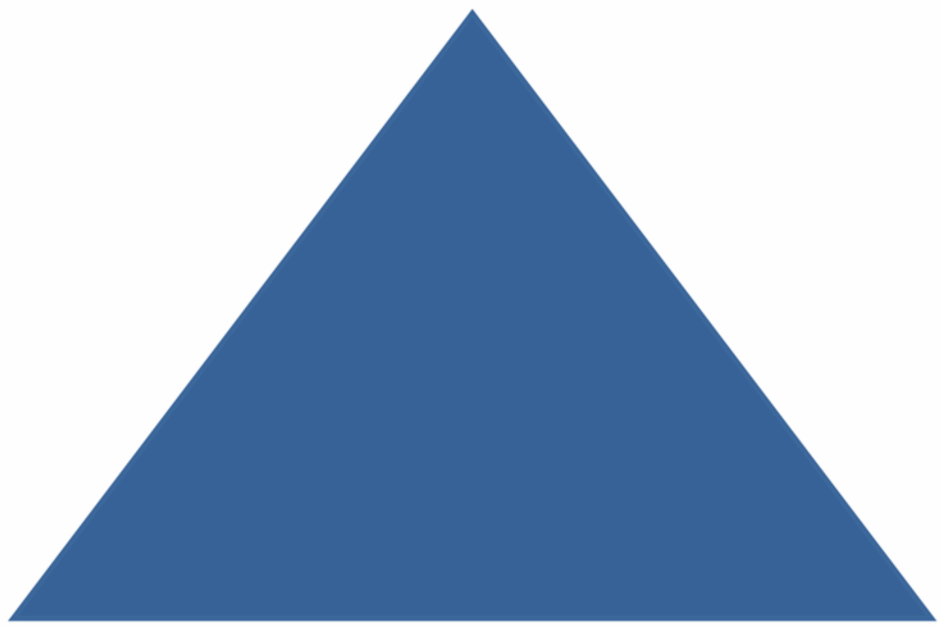
Match the triangles on the right with the name on the left by connecting with a line.

1	**Acute**	A	
2	**Obtuse**	B	
3	**Right**	C	
4	**Scalene**	D	
5	**Equilateral**	E	
6	**Isosceles**	F	

1.3.2: Growing and Shrinking Triangles

Investigation

Find the area and perimeter of the triangle.



If another triangle of the same shape has a perimeter that is double, what is the effect on the area? If another triangle of the same shape has a perimeter that is half, what is the effect on the area?

Hypothesis

If one triangle of the same shape has double the perimeter of the original triangle, the resulting

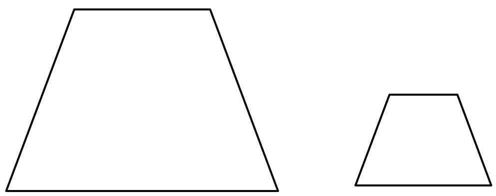
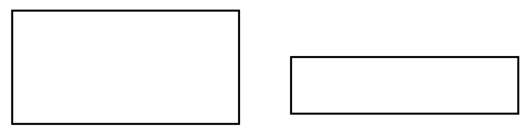
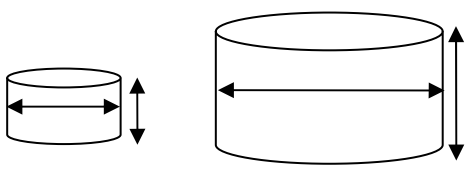
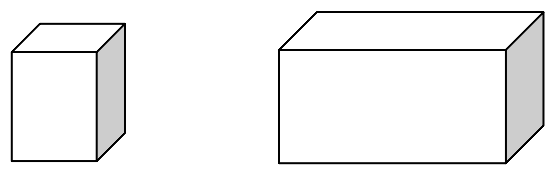
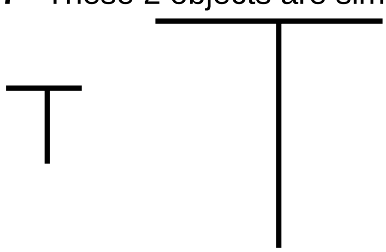
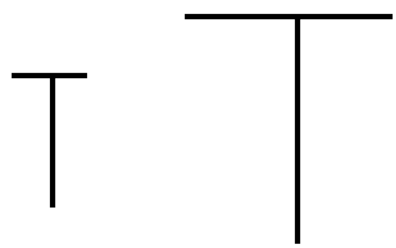
area of the triangle would be _________________________.

Complete the investigation.

Show your work and explain your reasoning. Generalize by stating the relationship between the perimeter and the area of similar triangles. State a conclusion based on your work. This conclusion may be based on your original hypothesis.

1.4.1 What is Similarity?

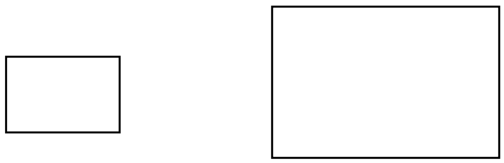
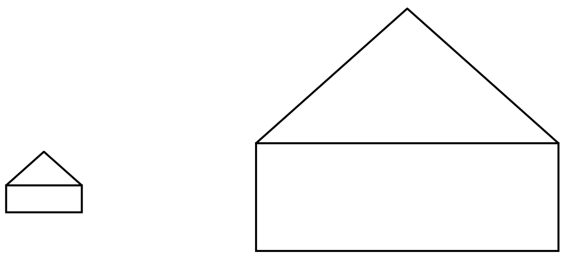
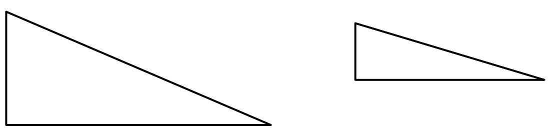
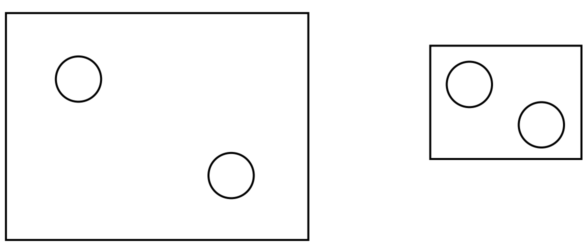
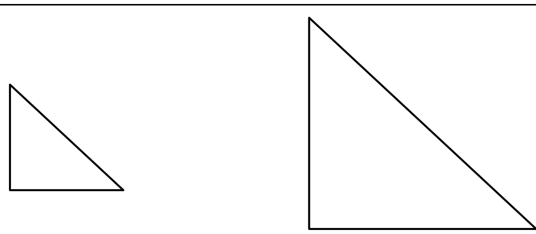
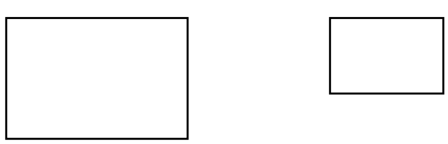
What does it mean if we say that 2 objects are similar?
See if you can find out by using the clues below.
Hint: Use a ruler and a protractor to make measurements.

Clue #1 These 2 objects are similar 	**Clue #2** These 2 objects are not similar 
Clue #3 These 2 objects are similar 	**Clue #4** These 2 objects are not similar 
Clue #5 These 2 objects are similar 	**Clue #6** These 2 objects are not similar 
Clue #7 These 2 objects are similar 	**Clue #8** These 2 objects are not similar 

Did you get it? What do you think similarity means?
Formal Definition of Similarity:

1.4.1 What is Similarity? (continued)

In each question, decide if the objects are similar (yes or no) and then explain:
Hint: Use a ruler and a protractor to make measurements.

	Similar? __________ Explain:
	Similar? __________ Explain:
	Similar? __________ Explain:
	Similar? __________ Explain:
	Similar? __________ Explain:
	Similar? __________ Explain:

1.4.2: What Is Similarity?

Anticipation Guide

Before		Statement	After	
Agree	Disagree		Agree	Disagree
		In a triangle, I can calculate the length of the third side if I know the length of the other two sides.		
		All triangles are similar.		
		All squares are similar.		
		When I enlarge a geometric shape, the number of degrees in each angle will become larger.		

K-W-L Chart

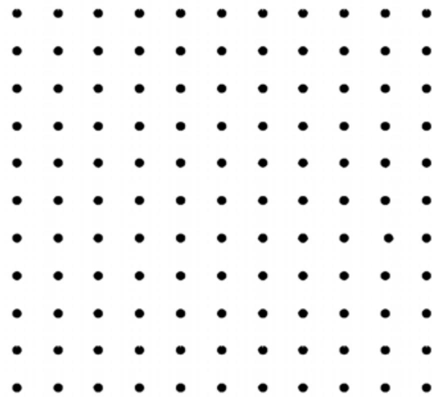
Statement	What I Know	What I Want to Know	What I Learned
Pythagorean relationship			
If two triangles are similar, then..			

1.4.3: What Is Similarity?

1. a) On your geoboard create a right-angled triangle with the two perpendicular sides having lengths 1 and 2 units.

   b) Create two more triangles on your geoboard that are enlargements of the triangle created in a).

2. Draw the three triangles using different colours on the grid and label the vertices, as indicated:
   – triangle one (label vertices ABC)
   – triangle two (label vertices DEF)
   – triangle three (label vertices GHJ)



3. a) Determine the lengths of the hypotenuse of each of the :

   (**Hint**: Pythagorean Theorem)

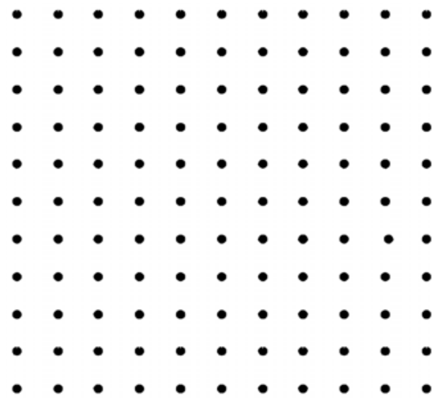
$\triangle$ABC	**$\triangle$DEF**	**$\triangle$GHJ**

   b) Indicate the length of each side of each triangle on the diagram.

1.4.3: What Is Similarity? (continued)

4. a) Place $\triangle$ABC, $\triangle$DEF, and $\triangle$GHJ on the geoboard so that one vertex of each triangle is on the same peg and two of the sides are overlapping.

   b) Copy your model on the grid.



5. a) What do you notice about the corresponding angles of $\triangle$ABC, $\triangle$DEF, and $\triangle$GHJ?

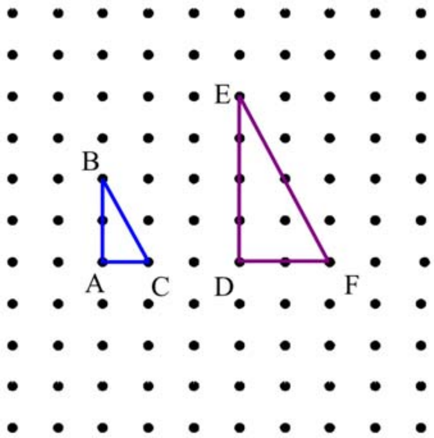
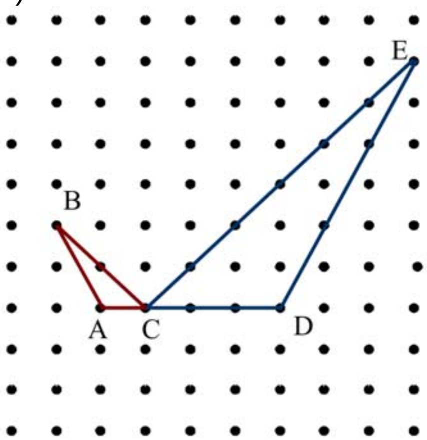
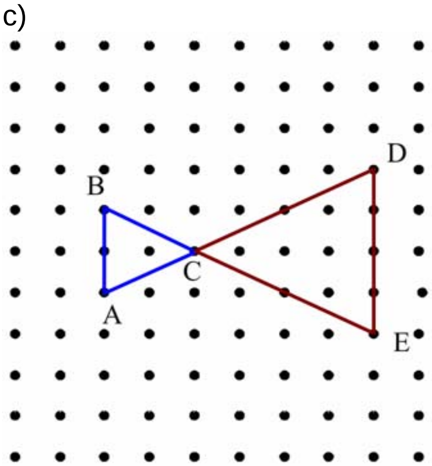
   b) What do you notice about the corresponding sides of $\triangle$ABC, $\triangle$DEF, and $\triangle$GHJ?

Summary

I know the following about similar triangles:

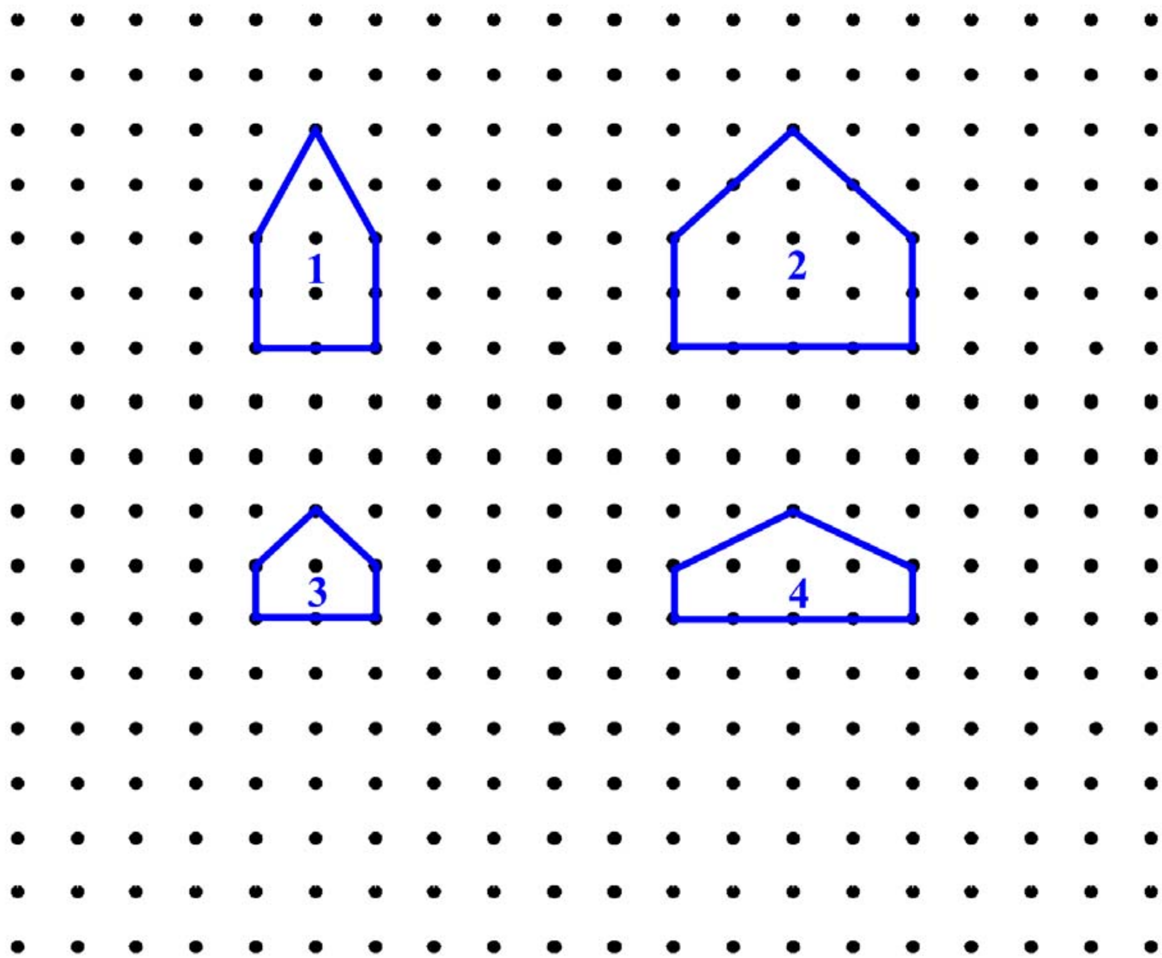
1.4.3: What Is Similarity? (continued)

6. Use the geoboards to explore whether the following triangles are similar.

a) 	Explain your reasoning.
b) 	Explain your reasoning.
c) 	Explain your reasoning.

1.4.4: Exploring Similarity

1. Which of the following four houses are similar? Explain why.
   Label the diagrams.



2. On the grid, draw a house that is similar to one of the figures.
   Complete the following statement:
   The house I drew is similar to house #______.

   I know this because:

1.5.1: Similar Triangles

Definition	**Properties/Characteristics**
Examples	**Non-examples**

Similar Triangles

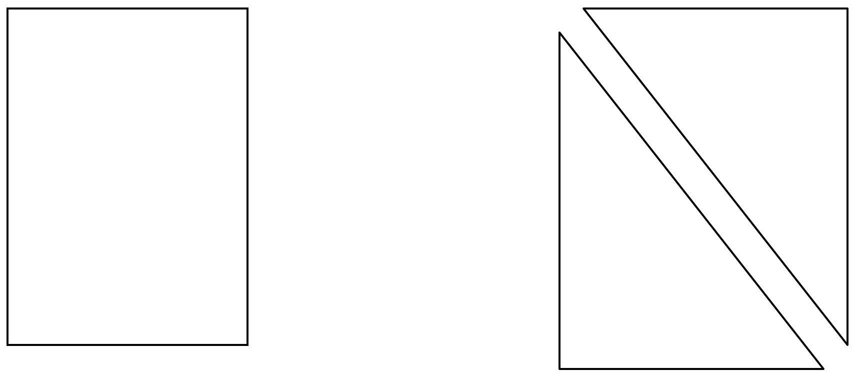
1.5.2: Finding Similar Triangles

You and your partner will need:

- one sheet of legal size paper and one sheet of letter size paper.
- protractor
- ruler
- scissors

1. Measure and label the side lengths on your piece of paper. Write a large signature across the back of your piece of paper. (You may need this later.)

2. Each rectangle has two diagonals. Fold your paper along one of the diagonals. Cut the paper along the diagonal.



3. What do you notice about the two triangles that you have created?

4. Take one of the two congruent triangles and set it aside. Take the other one and using a ruler and protractor draw a line that is perpendicular to the hypotenuse and passes through the vertex of the right angle. Cut the paper along this line. You should now have three triangles.

   Label the vertices of each triangle with appropriate letters (Largest triangle is ΔABC, Middle triangle is Δ DEF, Smallest triangle is ΔGHJ.)

   Explore the relationship between the triangles by reorienting them and overlapping the three triangles so that corresponding angles are in the same place.

5. Identify any triangles that you think are similar. Explain.

1.5.2: Finding Similar Triangles (continued)

6. Using a ruler and protractor complete the table below to determine whether the triangles are similar.

Triangle	Hypotenuse	Shortest side	Middle side	Angles
∆ABC				
∆ DEF				
∆GHJ				

7. Complete the following calculations.

$$\frac{Length \cdot of \cdot hypotenuse \cdot of \cdot \Delta DEF}{Length \cdot of \cdot hypotenuse \cdot of \cdot \Delta ABC} =$$

$$\frac{Length \cdot of \cdot hypotenuse \cdot of \cdot \Delta DEF}{Length \cdot of \cdot hypotenuse \cdot of \cdot \Delta GHK} =$$

$$\frac{Length \cdot of \cdot shortest \cdot side \cdot of \cdot \Delta DEF}{Length \cdot of \cdot shortest \cdot side \cdot of \cdot \Delta ABC} =$$

$$\frac{Length \cdot of \cdot shortest \cdot side \cdot of \cdot \Delta DEF}{Length \cdot of \cdot shortest \cdot side \cdot of \cdot \Delta GHK} =$$

$$\frac{Length \cdot of \cdot middle \cdot side \cdot of \cdot \Delta DEF}{Length \cdot of \cdot middle \cdot side \cdot of \cdot \Delta ABC} =$$

$$\frac{Length \cdot of \cdot middle \cdot side \cdot of \cdot \Delta DEF}{Length \cdot of \cdot middle \cdot side \cdot of \cdot \Delta GHK} =$$

8. What do you notice about the ratios you have calculated in each column? State each ratio. **This ratio is called a scale factor.**

1.5.2: Finding Similar Triangles (continued)

9. What conclusions about the triangles can you draw based on the ratios calculated in question 7? Are they similar or not? Explain.

10. If you were given a triangle with side lengths specified and a scale factor how could you use this information to determine the side lengths of the similar triangle that would be created?

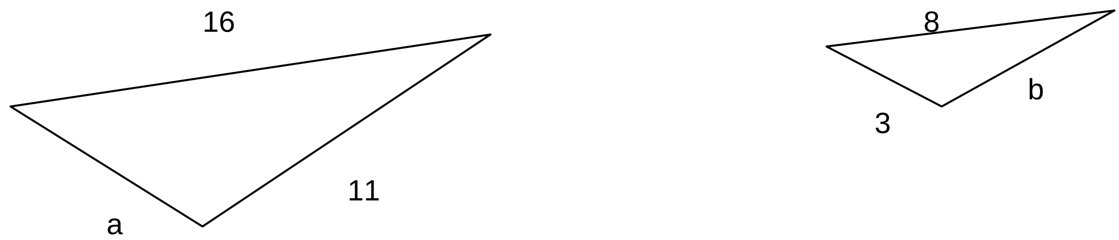
11. Use your method above to solve the following triangles.

12. Try to recreate your original rectangle.

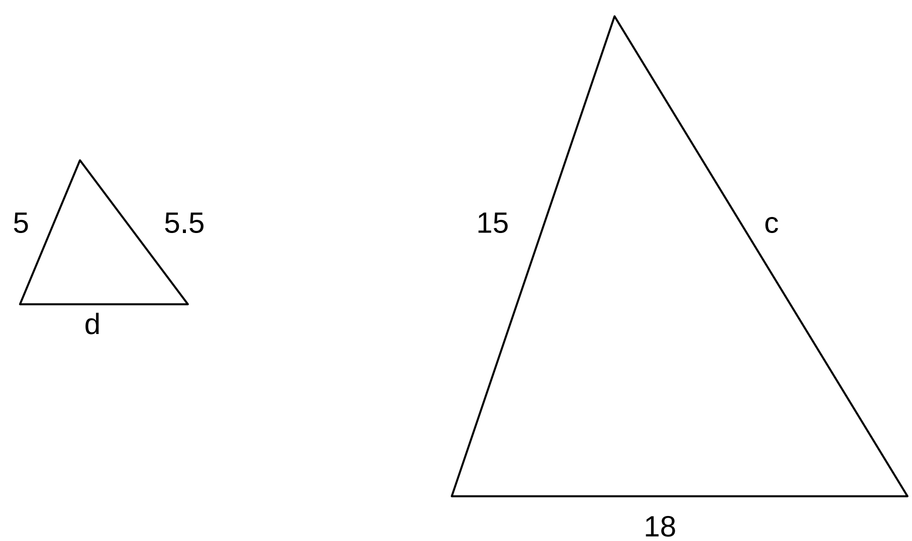
1.5.2: Similar Triangles Practice

1. Calculate the missing information for the following pairs of similar triangles.

   a)



   b)



1.6.1: Let's Do Proportions

1. State whether the ratios are proportional. Give reasons to support your answers.

a) $\frac{11}{12}, \frac{18}{27}$

b) $\frac{6}{102}, \frac{1}{17}$

c) $\frac{11}{8}, \frac{22}{16}$

2. Solve each proportion.

a) $\frac{2}{18} = \frac{b}{6}$

b) $\frac{a}{7} = \frac{18}{42}$

c) $\frac{2}{14} = \frac{1}{k}$

3. Solve each proportion.

a) $\frac{u}{12} = \frac{25}{10}$

b) $\frac{5}{d} = \frac{4}{6}$

c) $\frac{6}{8} = \frac{r}{9}$

4. Create a proportion from each set of numbers. Only use **four (4)** numbers from each set of numbers.

a) 21, 7, 18, 6, 14

b) 16, 2, 1, 21, 8

c) 10, 15, 20, 25, 30

1.6.2: Solving Those Proportions

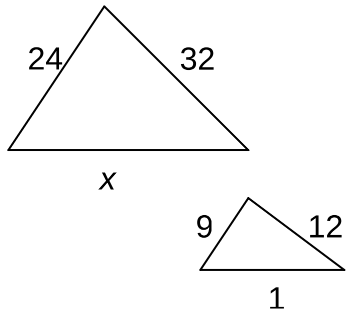
1. Solve the following.

a) $\frac{3}{5} = \frac{x}{20}$ b) $\frac{x}{3} = \frac{5}{6}$ c) $1.5:3 = y:10$ d) $h:25 = 4:10$

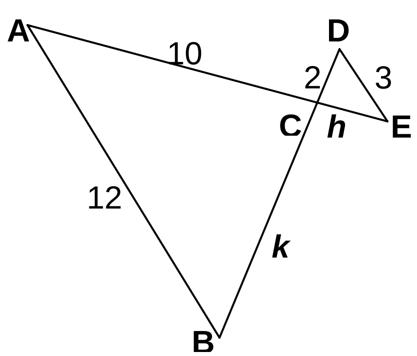
2. These are two similar triangles.

(a) Which proportion could be used to solve for *x*?

(b) Now, solve that proportion.



3. **AB** is parallel to **DE**. Solve for ***h*** and ***k***. (Hint: Redraw the triangles so that the corresponding angles are in the same position.)



1.6.3: Practice

1. **Flagpole**: The flagpole casts a shadow 14.5 m long at the same time that a person 1.8m tall casts a shadow 2.5 m long. Find the height of the flagpole. (Draw a diagram.)

2. **CN Tower**: The CN Tower casts a shadow 845.8m long. A 1.83m tall person standing near the tower casts a shadow 3.05m long. How tall is the CN Tower?

3. **Communication:** If two triangles are <u>**similar**</u>, explain, in your own words, what that means?

4. A triangle has sides whose lengths are 5, 12, and 13. A similar triangle could have sides with lengths of ________? Give side lengths of **two (2)** different similar triangles.

1.7.1: How Far?

ACTIVITY 1

Your arm is about ten times longer than the distance between your eyes. Verify.

Arm length: ___________ cm

Distance between eyes: ___________ cm

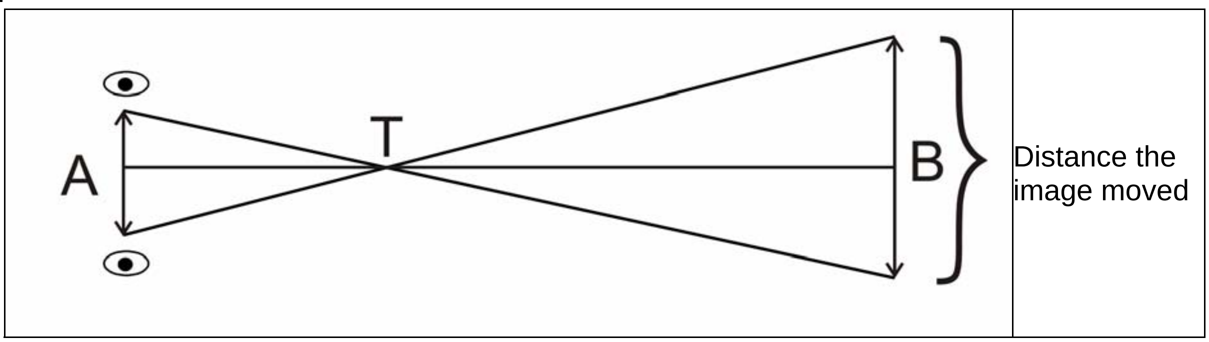
Ratio of arm length to distance between eyes: _________ cm

1. Select an object from which you want to determine the distance. _____________ (object)

2. Estimate the width of the object. ______________ cm

3. Hold one arm straight out in front of you, elbow straight, thumb pointing up. Close one eye, and align one side of your thumb with a particular spot on the front of the object. Without moving your head or arm, sight with the other eye. Your thumb will appear to jump sideways.
   a) Approximate the number of widths of the object your thumb appeared to move. _______
   b) What is the distance the image moved? _________ cm

4.



   In the diagram:

   T is the position of your thumb.
   AT represents the length of your arm.
   TB represents the distance from your thumb to the object.

   a) Indicate all known measurements on the diagram. Include units.

   b) Identify which triangles are similar. Label the triangle vertices.
   Write the proportion needed to find the distance the object is from you.

   c) Determine the distance the object is from you, using two different methods.

1.7.2: How High? – Part 1

ACTIVITY 2

1. Select an object whose base is at right angles to the ground and whose height you cannot measure. ____________________(object)

2. Measure the length of the shadow of the object. (Indicate units.) _____________

3. Hold a metre/yard stick at right angles to the ground, and measure the length of its shadow. (Use the same units as in question 2.) _________________

4. Draw similar triangles representing this situation in the space below. Label the diagram and indicate all known measurements with units.

5. Write the proportion needed to find the desired height.

6. Calculate the height of the object. *Show your work*.

1.7.3: How High? – Part 2

ACTIVITY 3

1. Select an object whose height you cannot measure. ____________________ (object)

2. Lay a small mirror horizontally on the ground exactly 1 metre in front of the object.

3. Slowly walk backwards until you can just see the top of the object in the mirror.

   Measure your distance from the mirror. ________________

4. Measure the distance from the ground to your eye level. _____________

5. Draw similar triangles representing this situation in the space below. Label the diagram and indicate all known measurements with units.

6. Write the proportion needed to find the desired height.

7. Calculate the height of the object. *Show your work*.

1.7.4: How High? – Part 3

ACTIVITY 4

1. Select an object whose height you cannot measure. ________________________________

2. **Person 1:** Walk at least 20 large steps away from the object.
   Place your eye as close to the ground as possible and close your top eye. Your job will be to line up the top of the metre stick with the top of the object.

3. **Person 2:** Place the metre stick between Person 1 and the object. The metre stick must be kept at a 90˚ angle with the ground. Slowly move the metre stick towards or away from the object on the instructions of Person 1. Hold still when Person 1 has lined up the objects.

4. **Persons 3 and 4:** Measure the distance from Person 1 to the metre stick. _____________

   Then measure the distance from Person 1 to the object. ______________

5. Draw similar triangles representing this situation in the space below. Label the diagram and indicate all known measurements with units.

6. Write the proportion needed to find the desired height.

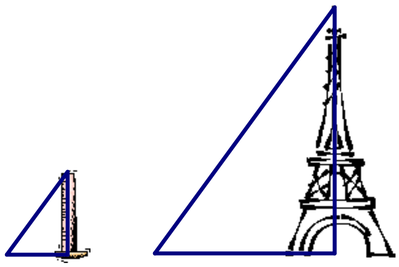
7. Calculate the height of the object. *Show your work.*

1.8.1: Eye, eye, eye!!

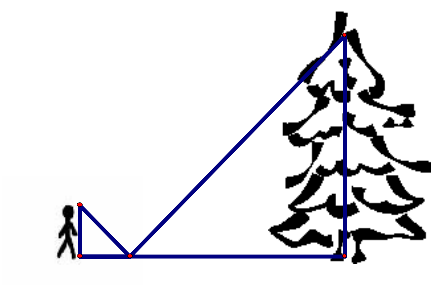
Hurricanes are violent storms, which form over the warm waters of the oceans. Each year hurricanes cause millions dollars of damage when they hit coastal areas. Hurricanes can produce winds with speeds up to 241 or more kilometres per hour. The centre of a hurricane is called the EYE. Inside the eye of a hurricane there is almost NO WIND. The air is perfectly calm and just outside the eye are the most violent winds of the storm. **How far across is the eye of this hurricane (in km)?** Photo taken with a 90mm camera lens on a Linhof camera at an altitude of 267 km. Draw a diagram to help.

1.8.3: Practice

1. A tower casts a shadow that is 750 m long. At the same time, a metre stick casts a shadow 1.4 m long. Label the diagram. Find the height of the tower.



2. Sam places a mirror on the ground, 5 m from the base of a tree. He then walks backwards until he can see the top of the tree in the mirror. He is now standing 0.75 m from the mirror. Sam's eye level is 1.75 m high. Label the diagram. Find the height of the tree.



1.W: Definition Page

Term	Picture / Sketch / Examples	Definition
Metre		
Liter		
Gram		
Kilo		
Deci		
Centi		
Milli		
Acute Triangle		
Obtuse Triangles		
Right Triangle		

1.W: Definition Page (Continued)

Term	Picture / Sketch / Examples	Definition
Scalene Triangle		
Equilateral Triangle		
Isosceles Triangle		
Similarity		
Corresponding Angles		
Corresponding Sides		
Ratio of Sides		
Proportion		

1.S: Unit Summary Page

Unit Name: ____

Using a graphic organizer of your choice create a unit summary.

1.R: Reflecting on My Learning (3, 2, 1)

3 Things I know well from this unit

2 Things I need explained more

1 Question I still have

1.RLS: Reflecting on Learning Skills

Students should be aware of the importance that these skills have on your performance. After receiving your marked assessment, answer the following questions. Be honest with yourself. Good Learning Skills will help you now, in other courses and in the future.

- E – Always
- G – Sometimes
- S – Need Improvement
- N – Never

Organization

- E G S N I came prepared for class with all materials
- E G S N My work is submitted on time
- E G S N I keep my notebook organized.

Work Habits

- E G S N I attempt all of my homework
- E G S N I use my class time efficiently
- E G S N I limit my talking to the math topic on hand
- E G S N I am on time
- E G S N If I am away, I ask someone what I missed,
- E G S N I complete the work from the day that I missed.

Team Work

- E G S N I am an active participant in pairs/group work
- E G S N I co-operate with others within my group
- E G S N I respect the opinions of others

Initiative

- E G S N I participate in class discussion/lessons
- E G S N When I have difficulty I seek extra help
- E G S N After I resolve my difficulties, I reattempt the problem
- E G S N I review the daily lesson/ideas/concepts

Works Independently

- E G S N I attempt the work on my own
- E G S N I try before seeking help
- E G S N If I have difficulties I ask others but I stay on task
- E G S N I am committed to tasks at hand

Yes No I know all the different ways available in my school, where I can seek extra help.

Yes No I tried my best.

What will I do differently in the next unit to improve?

____

____

____

____

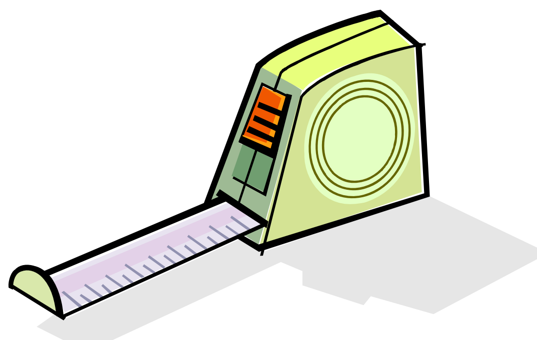
TIPS4RM

Targeted Implementation and Planning Supports for Revised Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Course: Grade 10 Applied Mathematics (MFM2P)

Unit 2: Trigonometry



Dufferin-Peel Catholic District School Board

Student

REVISED

August 2008

Unit 2
Trigonometry

2.1.2: What's My Ratio? Group Activity

Fill in each of the columns with information for your triangle.

					Determine the ratio to two decimal places		
Δ (state letter)	Angle	Length of hypotenuse	Length opposite side	Length of adjacent side	$\frac{opposite}{hypotenuse}$	$\frac{adjacent}{hypotenuse}$	$\frac{opposite}{adjacent}$
____	∠ ____°						
	∠ ____°						
____	∠ ____°						
	∠ ____°						
____	∠ ____°						
	∠ ____°						
____	∠ ____°						
	∠ ____°						

2.1.3: What's My Ratio? Individual Reflection

1. If you have a fifth triangle that is similar to your four triangles, what would your hypothesis be about the following ratios? Explain.

$\frac{\textbf{opposite}}{\textbf{hypotenuse}} =$	$\frac{\textbf{adjacent}}{\textbf{hypotenuse}} =$	$\frac{\textbf{opposite}}{\textbf{adjacent}} =$
Explanation:	Explanation:	Explanation:

2. Identify a relationship between the ratios in the chart for:

$\frac{\textit{opposite}}{\textit{hypotenuse}}$ and $\frac{\textit{adjacent}}{\textit{hypotenuse}}$

3. Identify a relationship if you divide the ratio for $\frac{\textit{opposite}}{\textit{hypotenuse}}$ by $\frac{\textit{adjacent}}{\textit{hypotenuse}}$ for one of the angles.

2.3.1: Who Uses Trigonometry Project

Content: Choose a career of interest that uses trigonometry.
Suggestions:

Aerospace	Archaeology	Astronomy
Building	Carpentry	Chemistry
Engineering	Geography	Manufacturing
Navigation	Architecture	Optics
Physics	Sports	Surveying

Process: Decide how you will learn more about the use of trigonometry in your chosen career.
Suggestions:

Internet research	text research	interview
job shadow	job fair	

Product: Select the way you will share what you learn.
Suggestions:

skit	newspaper story	brochure	poster
electronic presentation	photo essay	verbal presentation	report

Personal Selection Chart

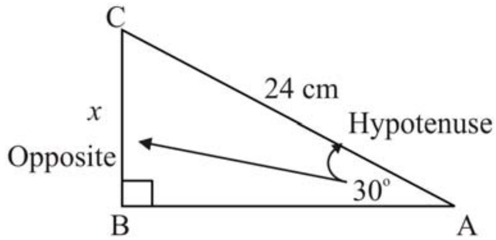
Your name: **Due date:**		
Content	**Process** **(you may choose more than one)**	**Product**
Teacher's comments and suggestions		

- Your final submission must include the following:
  - the career/activity investigated
  - a brief description of your process
  - description of the career/activity, including how trigonometry plays a role
  - list of sources used
- Your final submission can include some of the following:
  i) for a career
  - type of education/training required
  - potential average salary
  - employability
  - example of job posting (newspaper, Internet, etc.)

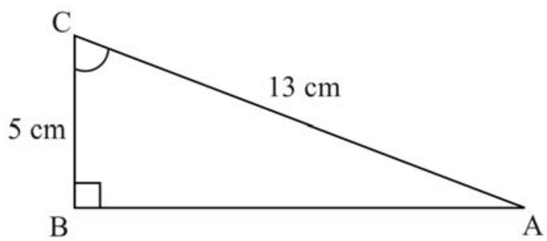
  ii) for a topic or activity
  - historical background
  - related issues

2.4.1: What's My Triangle?

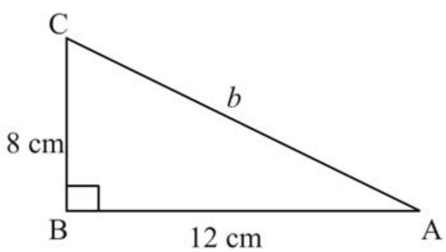
1. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *x*. Solve for *x*.



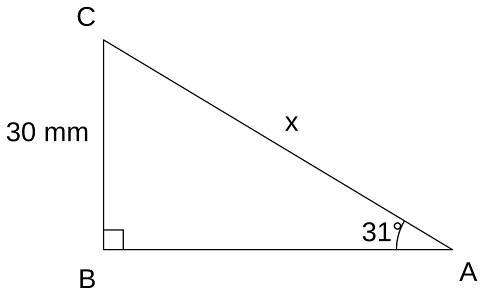
2. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find $\angle C$. Solve for $\angle C$.



3. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *b*. Solve for *b.*

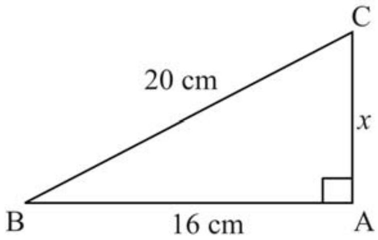


4. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *x*. Solve for *x.*

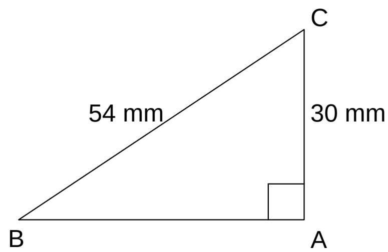


2.4.1: What's My Triangle? (Continued)

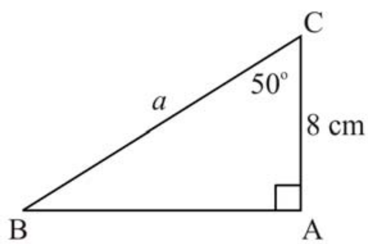
5. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *x*. Solve for *x.*



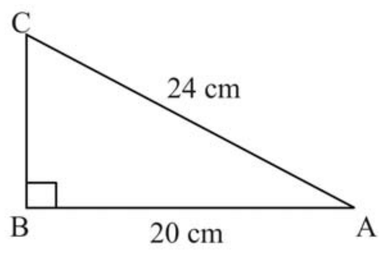
6. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find $\angle B$. Solve for $\angle B$.



7. Decide whether to use sine, cosine, tangent, or the Pythagorean relationship to find *a*. Solve for *a*.

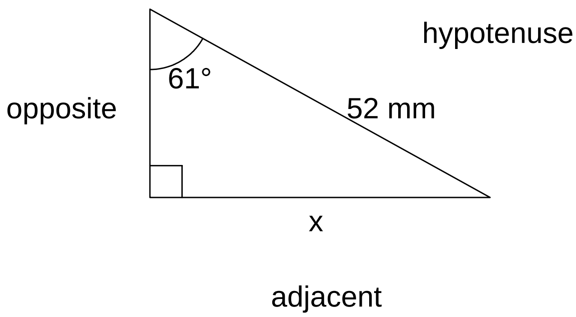
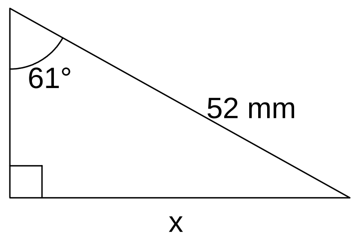
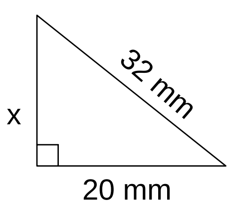
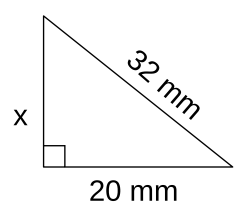


8. Decide whether to use sine, cosine, tangent, or Pythagorean relationship to find $\angle C$. Solve for $\angle C$.



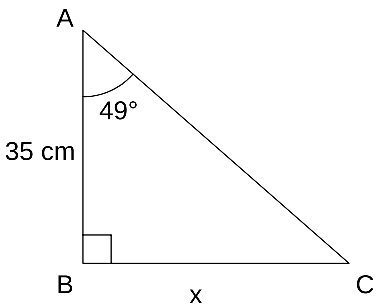
2.5.1: Going the Wrong Way

There are two problems shown below. For each problem, the answer provided is incorrect. Partner A will identify the errors in the given solutions. Partner B will write a correct solution to the problem.

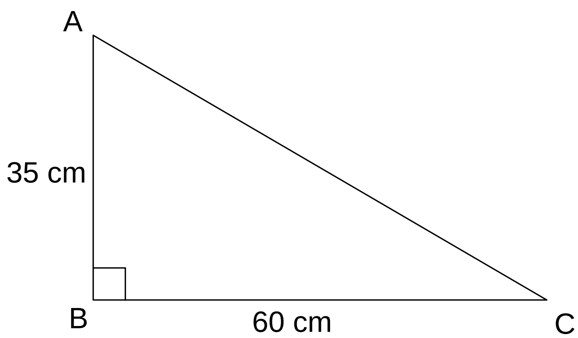
Partner A	**Partner B**
Solve for the missing side labelled x.  $\cos 61^\circ = \frac{52}{x}$ $\frac{0.485}{1} = \frac{52}{x}$ $x = \frac{52}{0.485}$ $x = 107.2$	Solve for the missing side labelled x. 
Solve for the missing side x.  $x^2 = 20^2 + 32^2$ $x^2 = 1424$ $x = \sqrt{1424}$ $x = 37.74$	Solve for the missing side x. 

2.5.2: Tangent or Something else

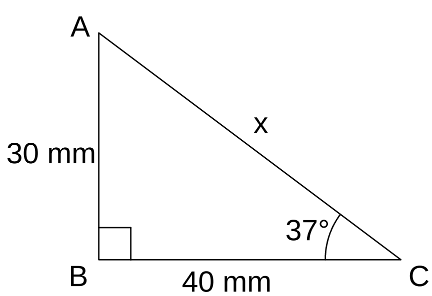
1. Decide whether to the use tangent ratio or the Pythagorean relationship to find *x.* Solve for *x*.



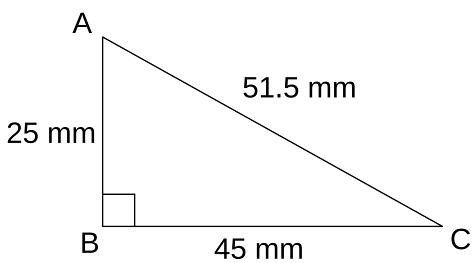
2. Decide whether to use the tangent ratio or the Pythagorean relation to find ∠A. Solve for ∠A.



3. Decide whether to the use tangent ratio or the Pythagorean relationship to find *x.* Solve for *x*.



4. Decide whether to use the tangent ratio or the Pythagorean relation to find ∠C. Solve for ∠C.



2.5.3: Who Uses Trigonometry Research Assignment

You are to investigate someone who uses trigonometry in their professional lives. You will be responsible for submitting:

- a report
- a presentation

The Report

The report should describe what the profession is all about. Let us know what they do and what type of education is needed to enter that profession. The report should also include a description of how trigonometry is used by the professional in their work. What types of problems do they need trigonometry for? Include one example of a problem that could be solved using trigonometry from the field of work you are researching. A list of resources that you used must be included. These may be articles, books, websites, magazines, etc…

The Presentation

The presentation should provide a quick snapshot of your research. Include visuals (pictures, graphics, etc…) related to the profession. The presentation can be a poster, newspaper article created by you, a brochure that you have created, a skit, an electronic presentation, etc.

Your presentation should highlight:

- your chosen profession
- education needed (ie. college / university / workplace) and courses in high school
- what kind of problems the professional will need to use trigonometry to solve

Where do you get information?

The internet is a great place to start. You can do a search using the title at the top of the page. This will give you an idea of different professions and then you can investigate the specific one you pick. If you know someone who actually is in one of those professions, ask them!! The library is a great place to start and to get help on research.

Types of presentations

If you decide to present a skit it should be 5 minutes and could involve 3 people maximum. If you select to write a newspaper story it should 350-400 words, one graphic, proper newspaper format, and includes one interview quote. A presentation done as a brochure should be 4 or 6 sided and has 2 graphics. If you want to do an e-presentation, it should include 12-14 slides and make use of different transitions. A verbal presentation would be 2-3 minutes and have interaction with the audience. A visual poster would be bristle board size.

2.5.3: Who Uses Trigonometry Research Assignment (Continued)

A Word on Plagiarism

Copying and pasting something from the internet is plagiarism. You are submitting someone else's work as your own. If I suspect that your voice is not coming through when I read the paper, I will question you on your sources.

Evaluation Rubric

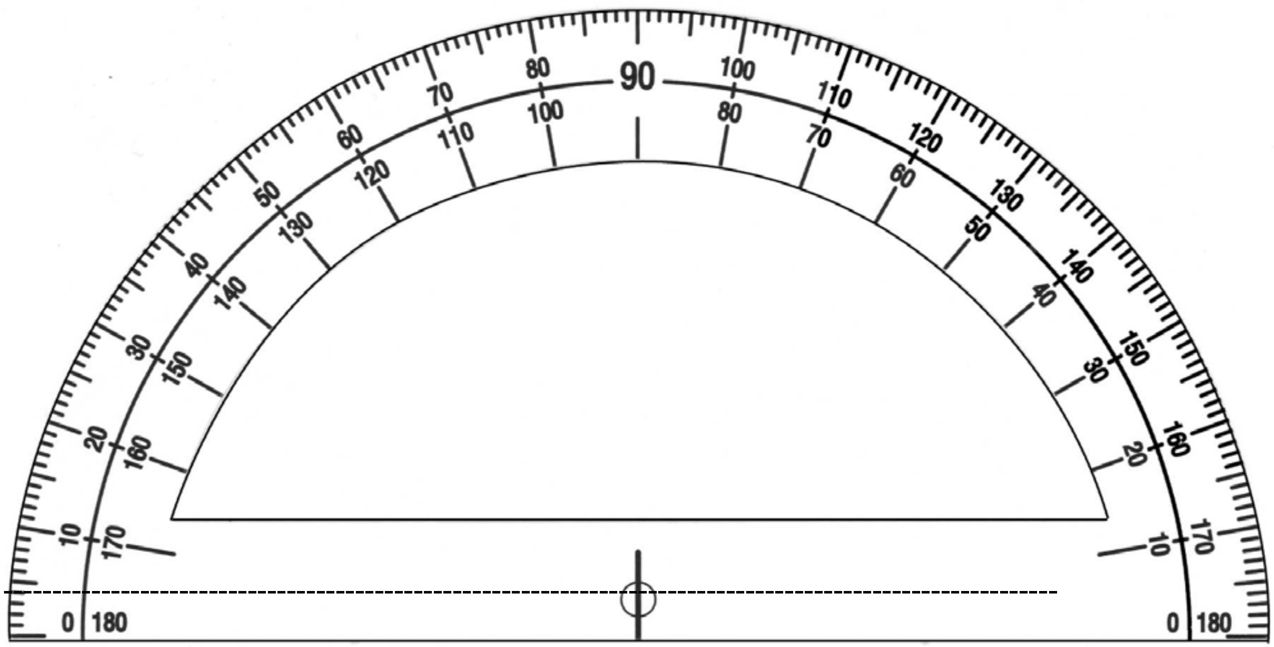
Your report will be evaluated using the following rubric.

Achievement Category	Level R	Level 1	Level 2	Level 3	Level 4
Knowledge/ Understanding	No evidence	Shows a limited understanding of the concepts	Shows some understanding of the concepts	Shows an understanding of the concepts	Shows a high degree of understanding of the concepts
Application	No evidence	Shows a limited connection between trigonometry and profession.	Shows some connection between trigonometry and profession.	Shows a connection between trigonometry and profession.	Shows more than one connection between trigonometry and profession.
Communication	No evidence	Report & poster shows limited clarity	Report & poster shows some clarity	Report & poster shows clarity	Report & poster shows a high degree of clarity

Comments:

2.6.1: Constructing a Clinometer

A clinometer is used to find the angle of elevation of an object.



Read all directions carefully before you begin

1. Cut along the dotted line above, and glue the protractor onto a piece of cardboard. Carefully cut around the edge of the protractor.
2. Take a 20 cm piece of string, and tie a washer or paperclip to one end. The other end should be taped to the flat edge of the protractor so that the end touches the vertical line in the center, and the string can swing freely. This can best be done by taping the string to the back of the protractor and wrapping it around the bottom.
3. Glue a straw to the flat edge of the clinometer. The finished product should look like **figure 1** below

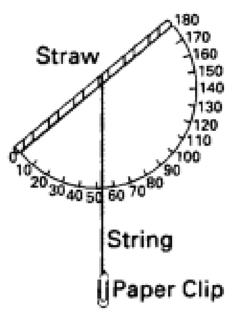


Figure 1

You can now use your clinometer. To find an angle of elevation, look through the straw to line up the top of an object. The string hanging down will then be touching the angle of elevation. Note: The angle you measure will always be less than 90º when you are reading the clinometer.

2.6.2: Applications of Trigonometry Assignment

Introduction

How would you find the height of a tree? You could climb to the top to measure it, but that would not be either safe or practical. How can we measure the height of clouds, airplanes or other highly inaccessible objects? Airports measure the clouds for pilots to let them know at what altitude they should fly. In this activity you will measure the heights of various objects using a single clinometer and trigonometric ratios.

You will measure the following heights:

1. ________________________________

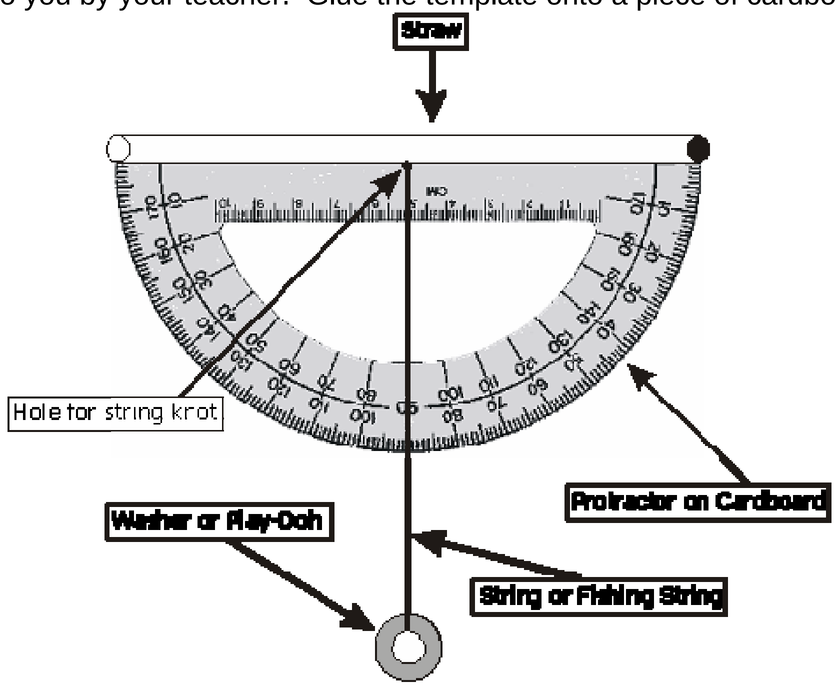
2. ________________________________

3. ________________________________

You must hand in the following details:
→ Show a table of data
→ Show ALL calculations
→ Table of results
→ Sources of error

Building Clinometer

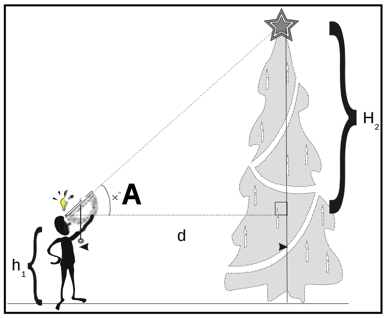
First you will need to make clinometer. You will be using the protractor template using the instructions on handout 2.6.1 given to you by your teacher. Glue the template onto a piece of cardboard.



2.6.2: Applications of Trigonometry Assignment (Continued)

Measuring Distances

Use a tape measure to find an appropriate distance back from the object you are finding the height of. Hold the clinometer level along the horizon line and adjust the angle of the straw to sight the top of the object through the straw.



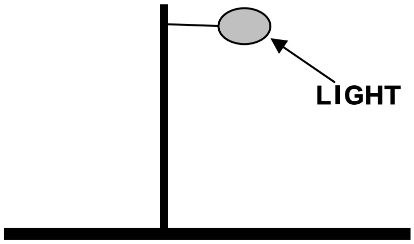
METHOD for finding inaccessible heights

Object Name	Height of person's eyes from ground (m)	Angle of Elevation (A)	Distance from Base (m)	Height of Object (Show work in box)

2.6.3: Applications of Trigonometry Assignment (Continued)

Analysis

1. If you were to measure the height of a light sticking out from a post could you use today's method? Explain why or why not.

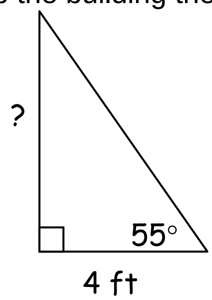


2. Darla is standing 15 m from the base of a building and using a clinometer she measures the angle of elevation to be 37°. If her eyes are 1.65 m above ground level, find the height of the building.

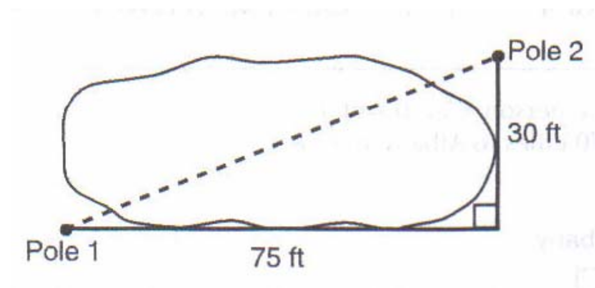
2.7.1 Applying Trigonometry

Use BLM 2.7.2 to organize your solution steps.
Then, solve the application questions. Find angles to the nearest degree and distances to the nearest tenth of a unit.

1. A ladder is leaning against a building and makes an angle of 62° with level ground. If the distance from the foot of the ladder to the building is 4 feet, find, to the nearest foot, how far up the building the ladder will reach.



2. The Dodgers Communication Company must run a telephone line between two poles at opposite ends of a lake as shown below. The length and width of the lake is 75 feet and 30 feet respectively.



What is the distance between the two poles, to the nearest foot?

3. A ship on the ocean surface detects a sunken ship on the ocean floor at an angle of depression of 50°. The distance between the ship on the surface and the sunken ship on the ocean floor is 200 metres. If the ocean floor is level in this area, how far above the ocean floor, to the nearest metre, is the ship on the surface?

4. Draw and label a diagram of the path of an airplane climbing at an angle of 11° with the ground. Find, to the nearest foot, the ground distance the airplane has traveled when it has attained an altitude of 400 feet.

2.7.2: Trigonometry -- Getting it together

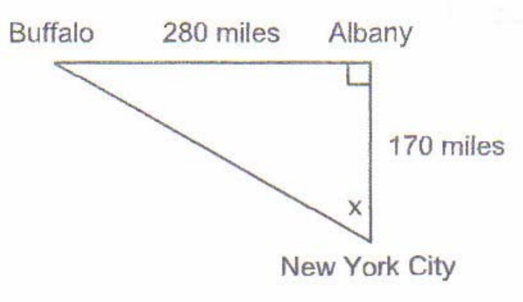
Use the following chart to analyze the applications given in the problems on BLM 2.7.1.

What is given? –*What angle and side measurements are stated in the problem?*
What is required? -- *What angle and side measurements do you need to find?*
What tools can be used to solve the problem? – *Name a trigonometric ratio.*

Application (include a diagram)	What is Given?	What is required?	What tools can be used to solve the problem?	Solution

2.7.3: Applying Trigonometry

Solve the application questions. Draw a diagram where necessary.
Find angles to the nearest degree and distances to the nearest tenth of a unit.



1. If an engineer wants to design a highway to connect New York City directly to Buffalo, at what angle, x, would she need to build the highway? Find the angle to the nearest degree.

To the nearest mile, how many miles would be saved by travelling directly from New York City to Buffalo rather than by travelling first to Albany and then to Buffalo?

2. In order to safely land, the angle that a plane approaches the runway should be no more than 10°. A plane is approaching Pearson airport to land. It is at an altitude of 850 m. It is a horizontal distance of 5 km from the start of the runway. Is it safe for the plane to land?

3. An 8 m long ramp reaches up a vertical height of 1m. What angle does the ramp make with the ground?

4. A tree casts a shadow 42 m long when the sun's rays are at an angle of 38° to the ground. How tall is the tree?

2.8.1: Who Uses Trigonometry? Organizer

Visit two other project presentations and collect information to return to your home groups.

<table>
<tr><th colspan="3">Title of Project:</th><th colspan="3">Presented by/Author:</th></tr>
<tr><td colspan="2">The type of education they need is…</td><td colspan="2">They use trigonometry in their job by…
(Include a description, example, or diagram)</td><td colspan="2">The most interesting thing is…</td></tr>
<tr><td colspan="2">One thing I'll remember is…</td><td colspan="2">I'm still wondering about…</td><td colspan="2">Someone who I think would be good at this job is…</td></tr>
</table>

2.W: Definition Page

Term	Picture / Sketch / Examples	Definition
Opposite Side		
Adjacent Side		
Hypotenuse		
Sine Ratio		
Cosine Ratio		
Tangent Ratio		
Pythagorean Formula		
Clinometer		
Angle of Elevation		

2.S: Unit Summary Page

Unit Name: ____

Using a graphic organizer of your choice create a unit summary.

2.R: Reflecting on My Learning (3, 2, 1)

3 Things I know well from this unit
2 Things I need explained more
1 Question I still have

2.RLS: Reflecting on Learning Skills

Students should be aware of the importance that these skills have on your performance. After receiving your marked assessment, answer the following questions. Be honest with yourself. Good Learning Skills will help you now, in other courses and in the future.

- E – Always
- G – Sometimes
- S – Need Improvement
- N – Never

Organization

- E G S N I came prepared for class with all materials
- E G S N My work is submitted on time
- E G S N I keep my notebook organized.

Work Habits

- E G S N I attempt all of my homework
- E G S N I use my class time efficiently
- E G S N I limit my talking to the math topic on hand
- E G S N I am on time
- E G S N If I am away, I ask someone what I missed,
- E G S N I complete the work from the day that I missed.

Team Work

- E G S N I am an active participant in pairs/group work
- E G S N I co-operate with others within my group
- E G S N I respect the opinions of others

Initiative

- E G S N I participate in class discussion/lessons
- E G S N When I have difficulty I seek extra help
- E G S N After I resolve my difficulties, I reattempt the problem
- E G S N I review the daily lesson/ideas/concepts

Works Independently

- E G S N I attempt the work on my own
- E G S N I try before seeking help
- E G S N If I have difficulties I ask others but I stay on task
- E G S N I am committed to tasks at hand

Yes No I know all the different ways available in my school, where I can seek extra help.

Yes No I tried my best.

What will I do differently in the next unit to improve?

____
____
____
____

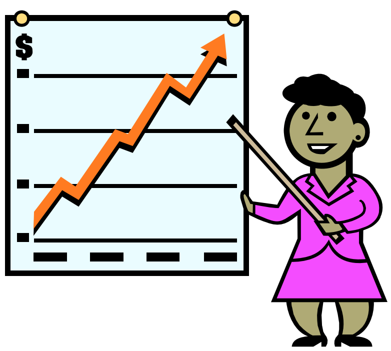
TIPS4RM

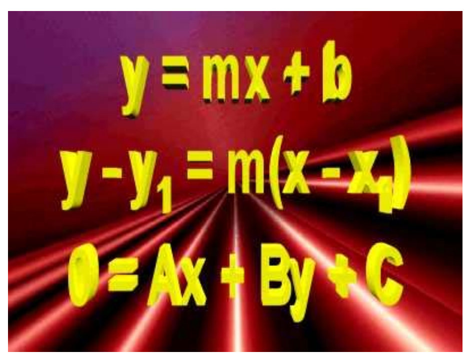
Targeted Implementation and Planning Supports for Revised Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Course: Grade 10 Applied Mathematics (MFM2P)

Unit 3: Equations of Lines





Dufferin-Peel Catholic District School Board

Student

REVISED

January 2009

Unit 3

Equations of Lines

3.1.1 Definition Match

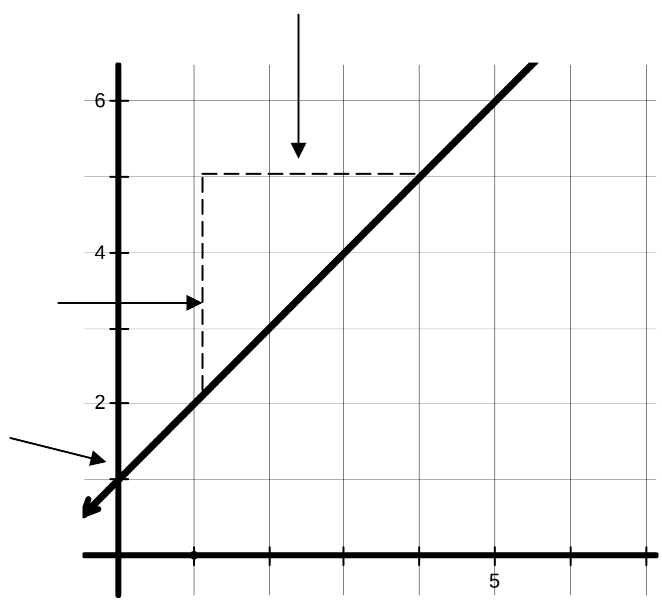
Definitions:

	An orderly arrangement of facts set out for easy reference (e.g., an arrangement of numerical values in vertical and horizontal columns)
	The difference between two consecutive y-values in a table in which the difference between the x-values is constant
	The vertical distance between two points
	The horizontal distance between two points
	A relation in which the graph forms a straight line
	A relation in which one variable is a multiple of the other
	A relation in which one variable is a multiple of the other plus a constant amount
	The change in one variable relative to the change in another
	The starting numerical worth or starting amount
	A description of how two variables are connected
	In a relation, the variable whose values you calculate; usually placed in the left column in a table and on the vertical axis in a graph

3.1.1 Definition Match (continued)

	In a relation, the variable whose values you choose; usually placed in the right column in a table of values and on the horizontal in a graph
	A line that best describes the relationship between two variables in a scatter plot
	A symbol used to represent an unspecified number. For example, x and y are variables in the expression x + 2y
	A relation whose graph is not a straight line

Graph:



= ________________________________

3.1.1 Definition Match (continued)

Equation

= x +

OR

= + x

Table of Values

Number of Weeks	Cost
0	65
10	75
20	85
30	95
40	105

= ______________________________

3.1.4: Reminiscing Old Relationships

There are 4 different envelopes that match the relationships below. Partner A will work on ENVELOPES A and C, Partner B will work on ENVELOPES B and D. Your job is to glue the appropriate values from your envelope onto the space provided.

ENVELOPE A	
Another Banquet Hall A banquet hall charges a flat rate of $300 plus $20 per person.	**Earning Money** Lindsay earns $10 per hour.
Initial Value:	Initial Value:
Rate:	Rate:
Independent Variable:	Independent Variable:
Dependent Variable:	Dependent Variable:

ENVELOPE B	
Money, Money! Ayda receives a base salary of $200 and $50 for every audio system he sells.	**Internet Fees** An internet package charges a flat fee of $10 plus $0.40 per hour.
Initial Value:	Initial Value:
Rate:	Rate:
Independent Variable:	Independent Variable:
Dependent Variable:	Dependent Variable:

3.1.4: Reminiscing Old Relationships (Continued)

ENVELOPE C

A Runner's Time

Time (s)	Distance (m)
0	0
1	2
2	4
3	6
4	8

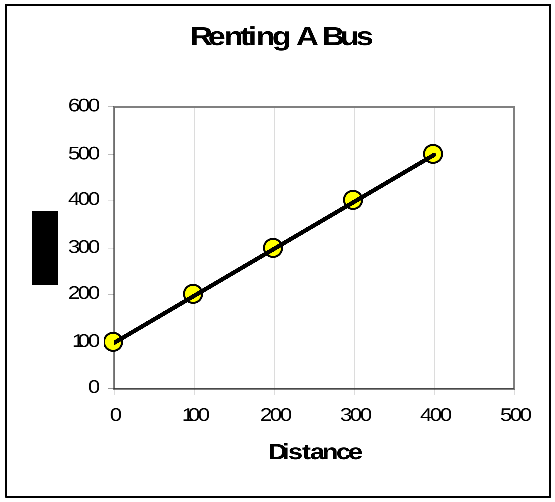
Initial Value:

Rate:

Independent Variable:

Dependent Variable:

Cost of Renting a Bus



Initial Value:

Rate:

Independent Variable:

Dependent Variable:

3.1.4: Reminiscing Old Relationships (Continued)

ENVELOPE D

Running Up The Stairs

Time (s)	Cost of Bus Charter ($)
0	10
1	12
2	14
3	15
4	16

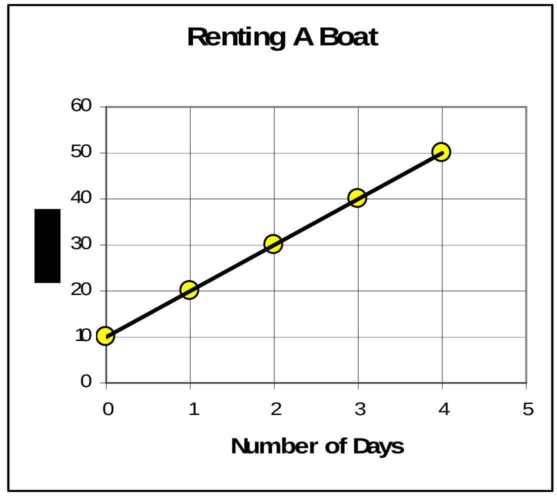
Initial Value:

Rate:

Independent Variable:

Dependent Variable:

Cost of Renting a Boat



Initial Value:

Rate:

Independent Variable:

Dependent Variable:

3.1.6: A Mathematical Spelling Bee

Procedure

1. You will work in partners where Partner A is the timer and Partner B is the recorder.

2. Create four quadrants by folding a piece a paper in half and fold in half again.

3. With a watch, student A will signal student B to start *printing* the full word **RUN** down one of the paper quarters as many times possible in 10 seconds. This is not a contest print at your normal printing speed.

4. After 10 seconds, student B signals student A to stop printing.

5. Count all the legible words.

6. Record this value in the table below.

7. Repeat steps 1 – 6 for the words **RATE**, **VALUE**, **CHANGE** and **INITIAL**

Recording Data

8. Record this value in the table below.

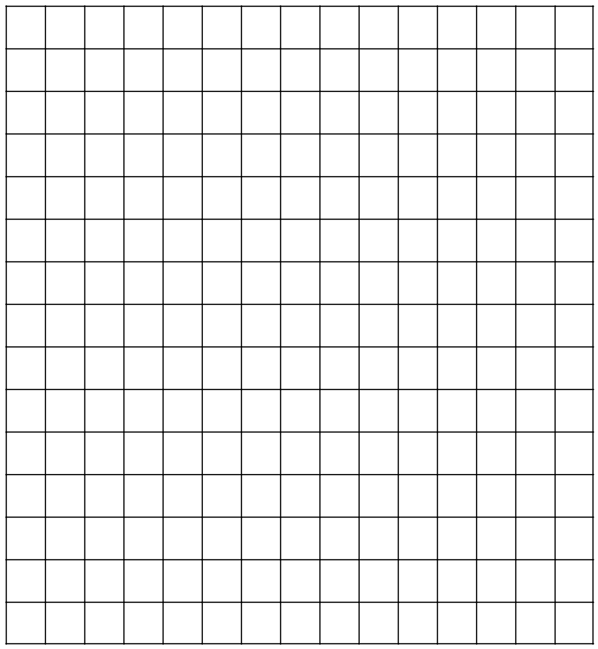
Word	Word Length	Number of Words Written
RUN		
RATE		
VALUE		
CHANGE		
INITIAL		

9. What is the independent variable? ______________________________

10. What is the dependent variable? _______________________________

3.1.6: A Mathematical Spelling Bee (Continued)

11. Create a scatter plot from your data on the grid provided. Label the axis with the independent variable on the x-axis and dependent variable on the y-axis.



12. Draw a line of best fit from the scatter plot above. Extend your line to both the x-axis and y-axis.

13. Using a rate triangle, calculate the rate of change of your line of best fit. _______________

14. Interpret the meaning of the rate of change as it relates to this activity.

15. At what value does the line cross the y-axis? ____________________

16. Interpret this value in the context of this activity.

17. At what value does the line cross the x-axis?? ___________________

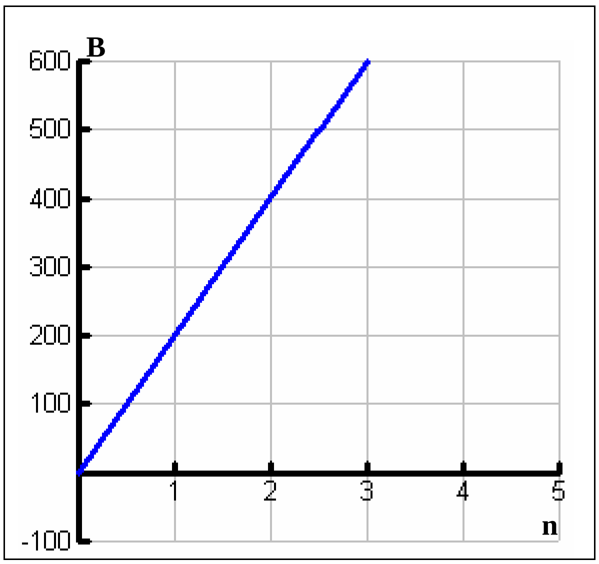
18. Interpret this value in the context of this activity.

3.1.8: Variables and Equations with Graphs

For each of the following graphs determine:

a) The rate and the initial value from the graph. Show your work on the graph.
b) A rule in words that relates the balance (B), the number (n) of weekly withdrawals or deposits and the initial amount in the account; and
c) An algebraic rule relating Balance (B), the number of weekly withdrawals/deposits (n) and the initial value in the account
d) Determine how much will be in the account after 12 weeks using the formula.

1. This person is *withdrawing/depositing* that is *positive/negative* correlation. Circle correct answers.



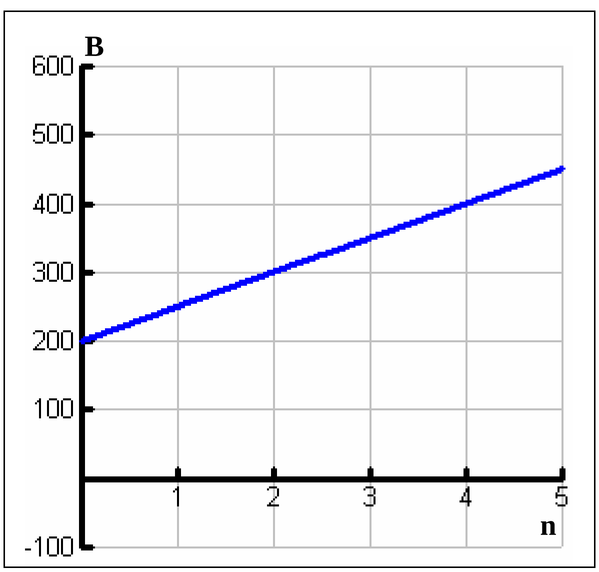
b) Rule in words:
Balance starts at _______ and ________(increase/decrease)by _________per week(rate).

c) Algebraic Rule

B =

d) After 12 weeks.

2. **This person is *withdrawing/depositing* that is *positive/negative* correlation. Circle correct answers.**



b) Rule in words:
Balance starts at _______ and ________(increase/decrease)by _________per week(rate).

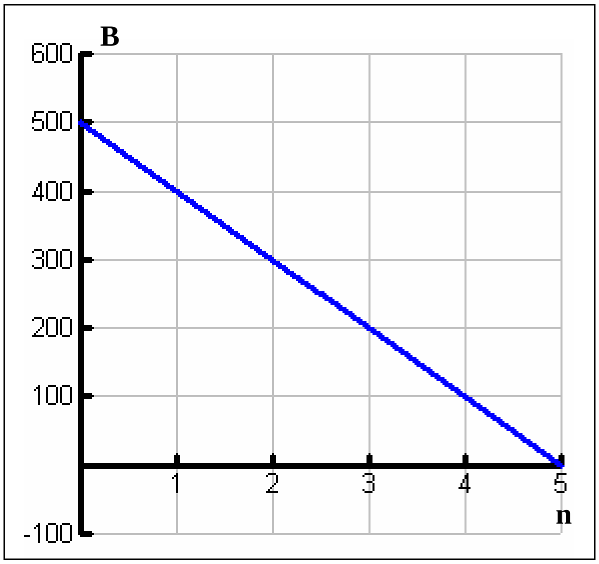
c) Algebraic Rule

B =

d) After 12 weeks.

3.1.8: Variables and Equations with Graphs (Continued)

3. **This person is *withdrawing/depositing* that is *positive/negative* correlation. Circle correct answers.**



b) Rule in words:
Balance starts at _______ and ________(increase/decrease)by _________per week(rate).

c) Algebraic Rule

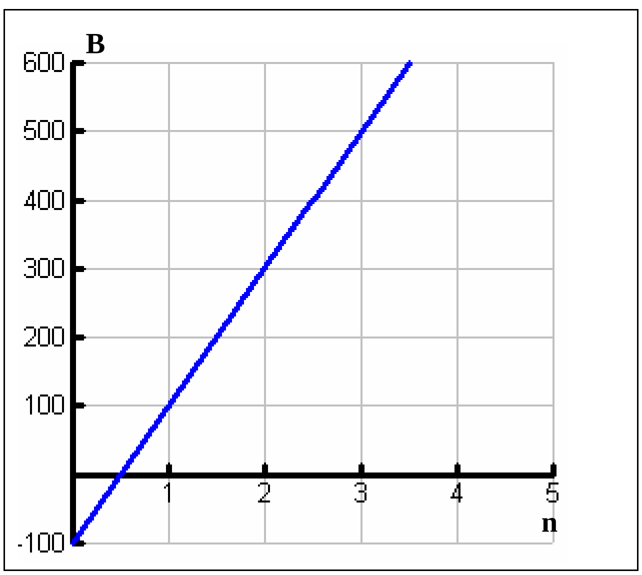
B =

d) After 12 weeks.

On a graph, the **initial value** is shown as the ____

On a graph, the **rate** is shown as ____

4. This person is *withdrawing/depositing* that is *positive/negative* correlation. Circle correct answers.



b) Rule in words:
Balance starts at _______ and ________(increase/decrease)by _________per week(rate).

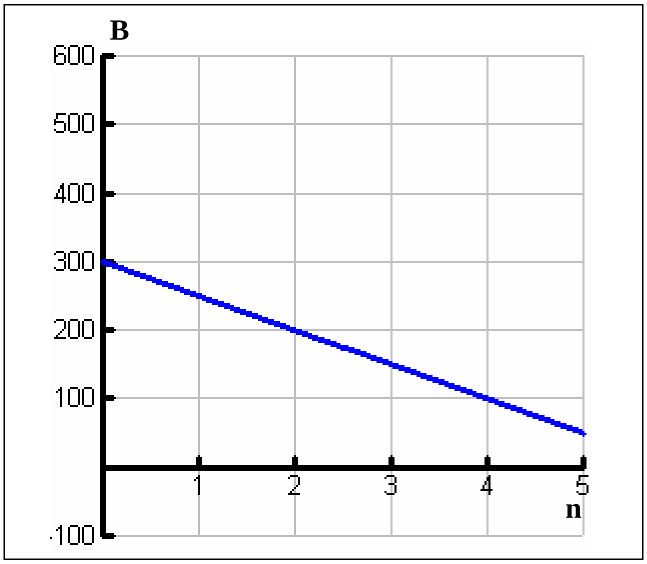
c) Algebraic Rule

B =

d) After 12 weeks.

3.1.8: Variables and Equations with Graphs (Continued)

5. **This person is *withdrawing/depositing* that is *positive/negative* correlation. Circle correct answers.**



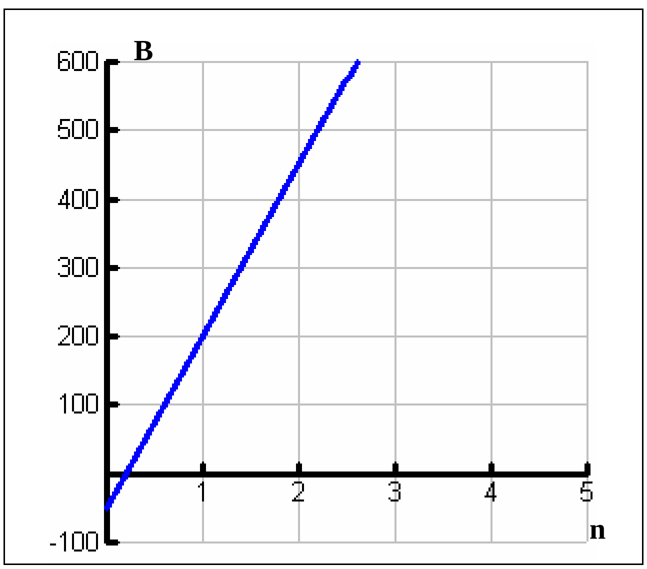
b) Rule in words:
Balance starts at _________ and _________by _________ per week.

<u>c) Algebraic Rule</u>

B =

d) After 12 weeks.

6. **This person is *withdrawing/depositing* that is *positive/negative* correlation. Circle correct answers.**



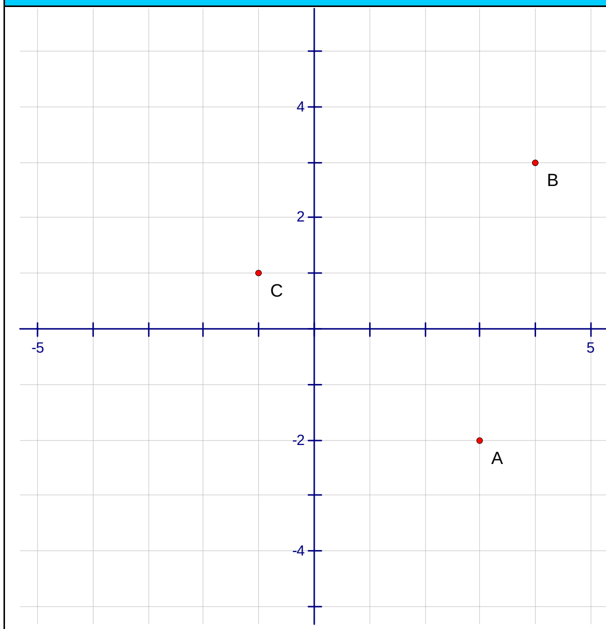
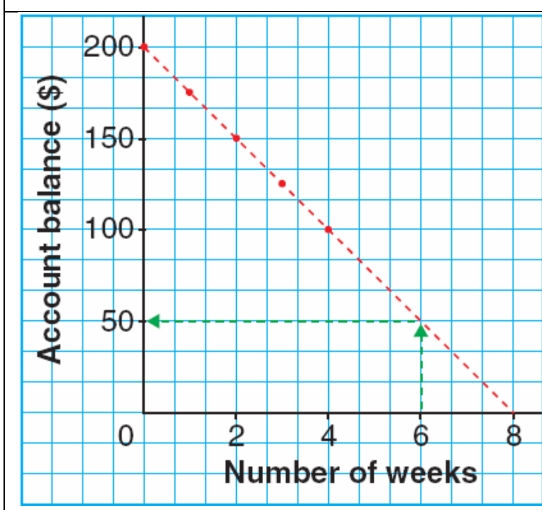
b) Rule in words:
Balance starts at _________ and _________by _________ per week.

<u>c) Algebraic Rule</u>

B =

d) After 12 weeks.

3.2.1: Agree to Disagree

For each question stand if you agree or remain sitting if you disagree.	Class Consensus (Agree / Disagree)
 a) Point A has coordinates (3, -2) b) Point B has coordinates (3, 4) c) Point C has coordinates (-1, 1) d) Point A is in Quadrant 4 e) The origin is located at (0, 0)	a) b) c) d) e)
 a) The rate of change is $25/week b) The initial value is $200	a) b)

3.2.1: Agree to Disagree (Continued)

<table>
<tr><th>For each question stand if you agree or remain sitting if you disagree.</th><th>Class Consensus (Agree / Disagree)</th></tr>
<tr><td rowspan="3">A family meal deal at Chicken Deluxe costs $26, plus $1.50 for every extra piece of chicken added to the bucket.

a) The rate of change is $26.

b) The initial value is 426.

c) The independent variable is number of pieces of chicken</td><td>a)</td></tr>
<tr><td>b)</td></tr>
<tr><td>c)</td></tr>
<tr><td rowspan="3">A Chinese food restaurant has a special price for groups. Dinner for two costs $24 plus $11 for each additional person.

a) The rate of change is $11

b) The initial value is $11

c) The dependent variable is the number of people</td><td>a)</td></tr>
<tr><td>b)</td></tr>
<tr><td>c)</td></tr>
<tr><td rowspan="3"><table><tr><th>Number of Toppings</th><th>Cost of a Large Pizza ($)</th></tr><tr><td>0</td><td>9.40</td></tr><tr><td>1</td><td>11.50</td></tr><tr><td>2</td><td>13.60</td></tr><tr><td>3</td><td>15.70</td></tr><tr><td>4</td><td>17.80</td></tr></table>
a) The initial value is 9.40

b) The rate of change is $1.10

c) Dependent variable is the Cost of a Large Pizza</td><td>a)</td></tr>
<tr><td>b)</td></tr>
<tr><td>c)</td></tr>
</table>

3.2.2: Exploring an MB Eh!

Y-int Slope Form

$y = mx + b$

What does the m and b represent?

Exploring the m

- We already know that in a table of values for a linear relationship a pattern will form. This pattern is the

- Pattern →

Equation →

X	Y
-2	4
-1	6
0	8
1	10
2	12

3.2.2: Exploring an MB Eh! (Continued)

Exploring the m

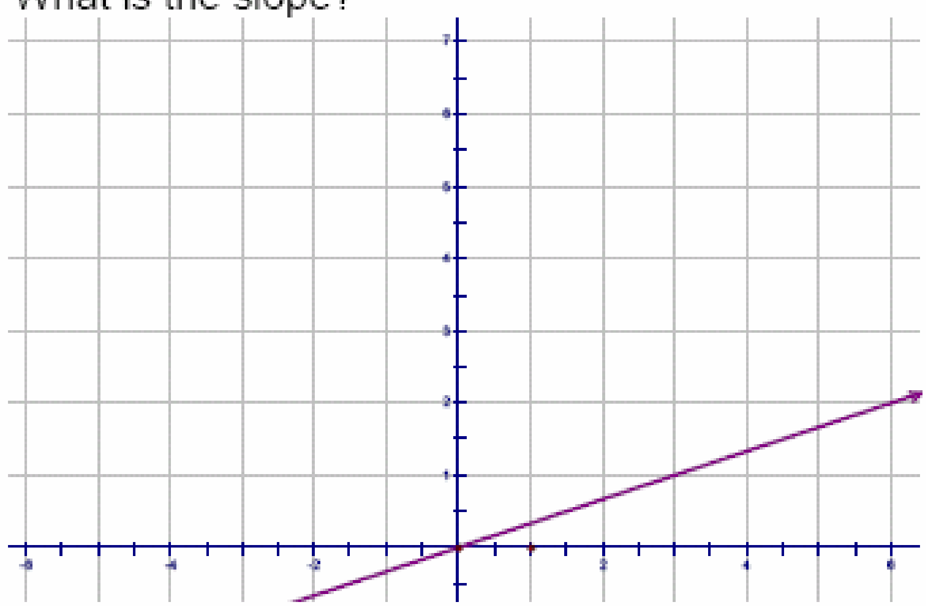
- What is the pattern?
- Pattern →
- What is the equation?

X	Y
-2	7
-1	4
0	1
1	-2
2	-5

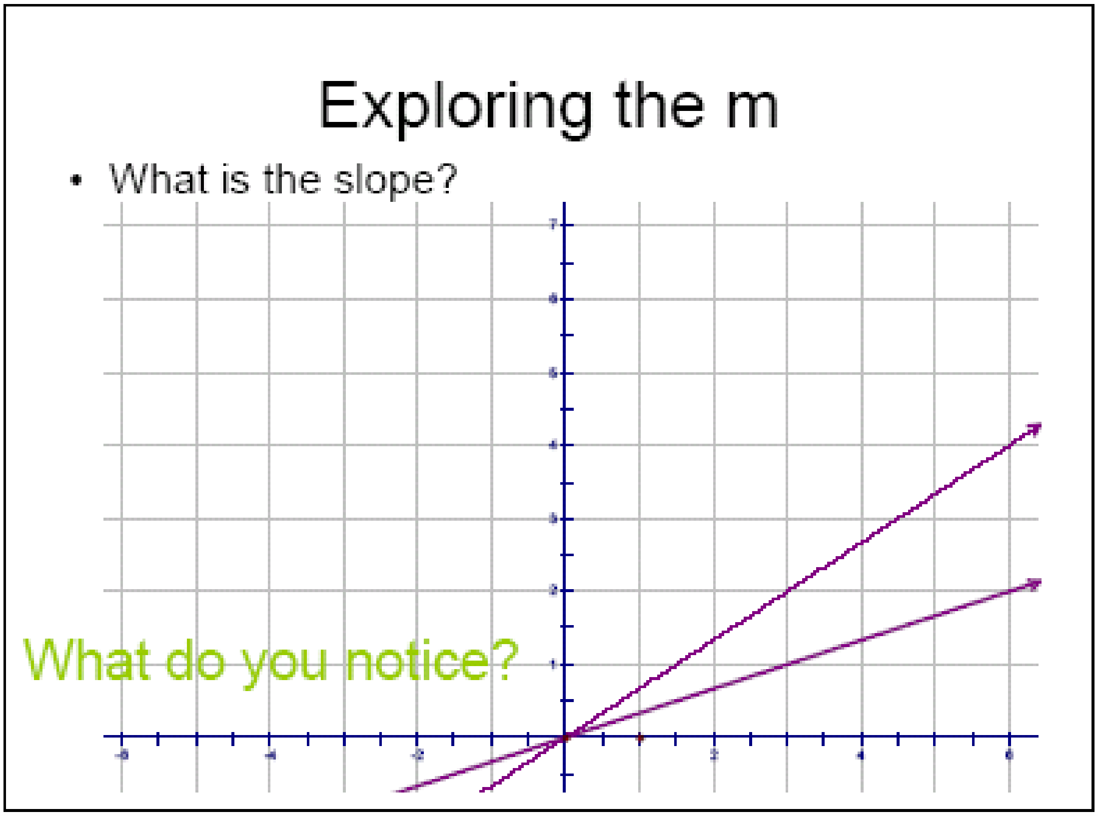
Equation →

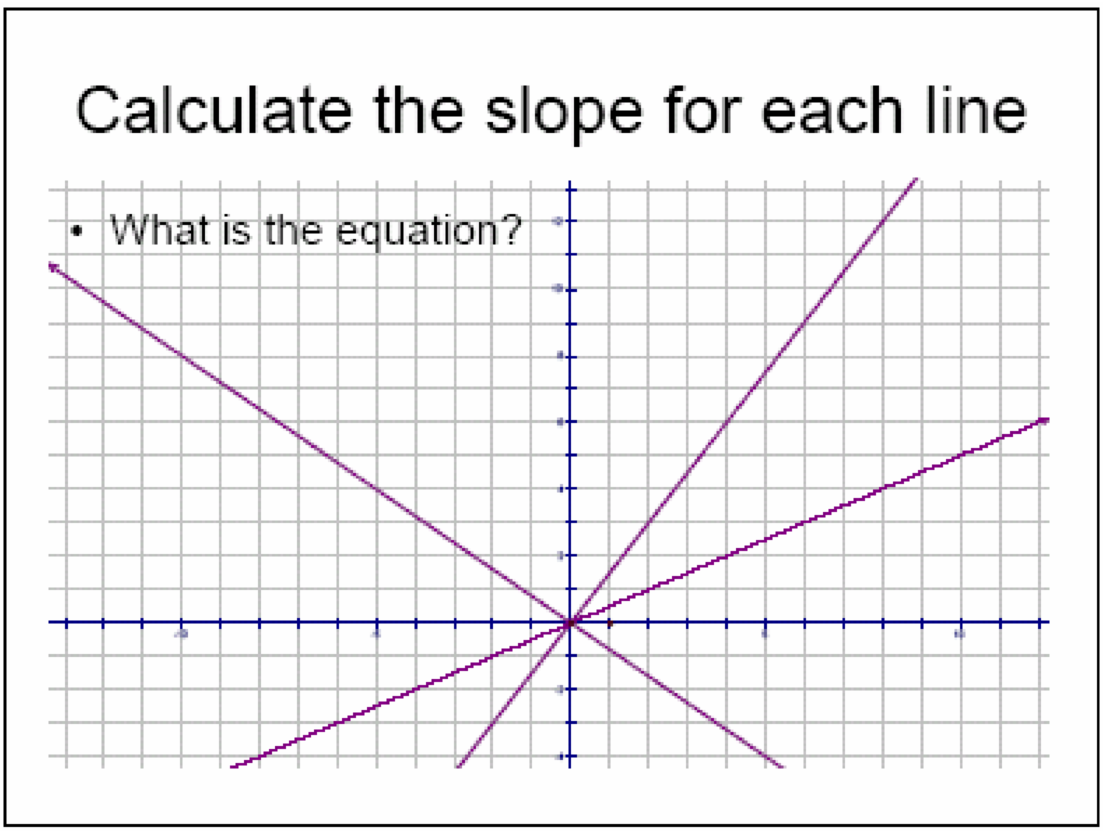
Exploring the m

- What is the slope?



3.2.2: Exploring an MB Eh! (Continued)





3.2.2: Exploring an MB Eh! (Continued)

What does the m represent?

What is the slope and
what does the m represent?

$$y = \frac{3}{2}x$$

$$y = \frac{1}{5}x$$

$$y = \frac{-5}{2}x$$

3.2.2: Exploring an MB Eh! (Continued)

Exploring the b

- Look at the table and look at the equation.
- What do you notice?
- When $x = 0 \rightarrow$
- Equation has

X	Y
-2	4
-1	6
0	8
1	10
2	12

Equation $\rightarrow$

Exploring the b

- Look at the table and look at the equation.
- What do you notice?
- When $x = 0 \rightarrow$
- Equation has

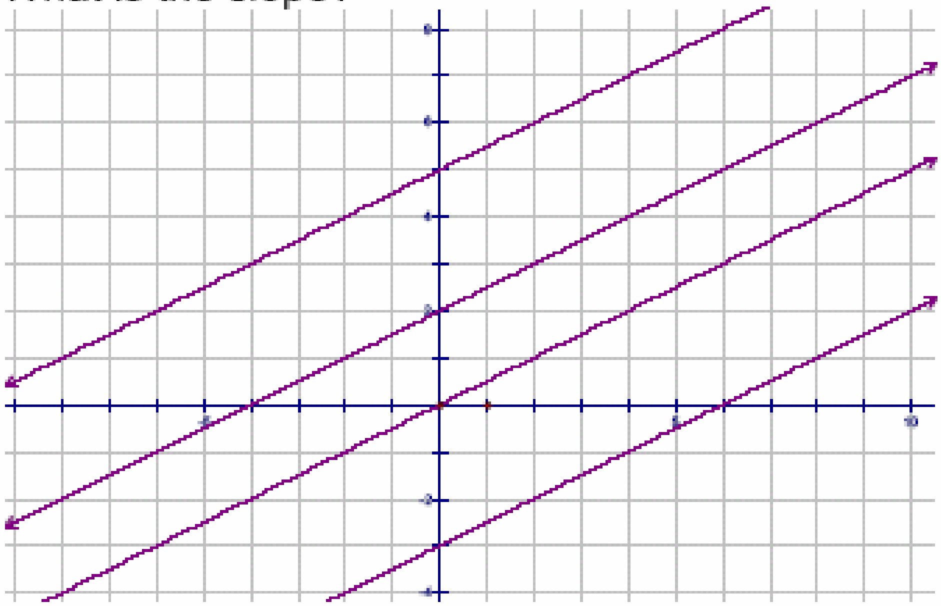
X	Y
-2	7
-1	4
0	1
1	-2
2	-5

Equation $\rightarrow$

3.2.2: Exploring an MB Eh! (Continued)

Exploring the b

- What is the slope?



What does the b represent?

3.2.2: Exploring an MB Eh! (Continued)

What does the equation tell you?

- $y = 4x - 1$
- $y = {}^{3}/_{2}x + 2$
- $y = {}^{1}/_{5}x - 3$
- $y = -2x$
- $y = {}^{-5}/_{2}x + 10$

3.2.4: Why Mr. Y depends on the independent Ms. X?

Complete the tables on the next two pages that compare and contrast terms, equations, tables of values and graphs between grade 9 and grade 10.

Grade 9 Topics – Initial Value, Rate of Change, Independent and Dependent Variable	New Grade 10 Topics – y-intercepts, slope, x and y	Similarities	Differences
Terminology			
Equation			

3.2.4: Why Mr. Y depends on the independent Ms. X? (Continued)

Grade 9 Topics – Initial Value, Rate of Change, Independent and Dependent Variable	New Grade 10 Topics – y-intercepts, slope, x and y	Similarities	Differences
Table of Values			
Graphs			

3.2.4: Why Mr. Y depends on the independent Ms. X? (Continued)

Complete the following table for each equation given. Provide a different context for each row if possible.

Equation	Slope	Real Context for Slope	y-intercept	Real context for y-intercept	Real context equation
Y = 2.5x + 5	2.5	$2.50/km	5	$5 starting fee	C = $2.50d + $5 (C represents cost and d represents distance a cab travels)
Y = 2x + 17					
y = 250 – 10x					
y = 1.5 + x					
y = 100x – 2000					
y = 75x					

3.3.1 Slopes and Stuff on TI-83

Instructions for TI-83

Ok, if you follow this step-by-step, it will be fool-proof. Let's start!

Press **ON**
Press **APPS**
Scroll and find **TRANSFRM**
Press **ENTER**
Select **UNINSTALL** by pressing **ENTER**
Press **APPS** again
Scroll and find **TRANSFRM**
Press **ENTER**
Now the screen should say "PRESS ANY KEY", so press any key to continue
Your screen will say DONE
Press **Y=** (grey button, white font, top left)

You now need to enter **AX+B.**
Do you see all the green letters on the calculator? You can get to them by pressing the **ALPHA** button (green button, white font)
So, to get A, you need to press **ALPHA**, then **MATH**. See?
X is the button to the right of the **ALPHA** button (the button with **X,T, ,n**)
The "+" sign you can find for sure and can you figure out how to type B?

So now you should have AX+B entered on the screen!
A few more steps and we're ready to graph.
Press **WINDOWS**
Scroll up once so that **SETTINGS** is highlighted
Scroll down and change A to 1, change B to 1 and change Step to 1.
Ok, you're ready!

Press **GRAPH**!

Scroll right and left to see what happens to A.
If you want to play with B, scroll down once so that the equal sign for B is highlighted and then scroll right and left as well to change B.

Picture Source:http://education.ti.com/educationportal/sites/US/productCategory/us_graphing.html

3.3.2 Slopes and Stuff on TI-83 - Investigation

Worksheet for graphing calculator

1. Describe the graph when A is greater than 1.	Draw an example.
2. What is the difference between A = 2 and A = 6?	Draw A = 2 on the left and draw A = 6 on the right.
3. What happens when A = 0?	Draw an example.
4. Describe the graph when A is less than 0.	Draw an example.
5. What is the difference between A = -2 and A = -6?	Draw A = -2 on the left and draw A = -6 on the right.

3.3.2 Slopes and Stuff on TI-83 - Investigation
(continued)

6. When you are changing A, what stayed the same?	
7. What happens when B = 5?	Draw an example.
8. What happens when B = -6?	Draw an example.
9. When you are changing B, what stayed the same?	
10. In the equation y = mx + b, what does letter A represent? What about B?	

3.3.2 Slopes and Stuff on TI-83 - Investigation
(continued)

Almost done. But since we're finished with the Transform applications, please help me uninstall it first before we move on.

Press **APPS**
Scroll and find **TRANSFRM**
Press **ENTER**
Select **UNINSTALL** by pressing **ENTER**

Using your equation that you got from your teacher, type this into your graphing calculator.

Press **Y=** and enter the equations (remember, X is the button with **X,T, ,n**).
Press **GRAPH**

You should see your graph on your screen. Walk around the room and find a line that looks parallel to yours from another student. If you want to see whether the lines are parallel, type the equation from the student you found into your calculator as well. Just repeat the above instructions and enter the second equation into $\mathbf{Y_2 =}$. Press **GRAPH** again.

Are they similar? If they are, compare the two equations. What is the same?

What can you conclude about parallel lines?

Check this by finding another pair of students and discuss your conclusions briefly with them.

Write down your conclusion below.

3.3.4 Slopes and Stuff on GSP (Optional)

Student Instructions for GSP

Ok, Geometer's Sketchpad is a great way to see just how the slope and y-intercepts work. Follow these instructions and they will help you create what you need in order for you to start investigating. Good luck!

First, let's launch Geometer's Sketchpad on the computer. Click on any white space to get rid of the logo.

Let's see some grid. Select **Show Grid** from the **Graph** menu. Great, now we're ready to create a line.

Select **Plot Points** from the **Graph** menu.
Enter 0 (left text box), and 1 (right text box).
Click **Plot**. Click **Done**.

Click on the **Point Tool** on the left hand side menu.
Create a point anywhere you want.

Click and hold the **Line Tool** on the left hand side menu until a line with arrows on both ends appear and select that option. Click on point (0,1) and click on the point that you created to create a line.

Click on the **Arrow Tool** on the left hand side menu and click on any white space. Now click on the line so that only the line is highlighted.

Select **Slope** from the **Measure** menu. Click on any white space. Click on the line. If you point your cursor on Point B, you can now click and drag the line! Look at the slope number!

Answer questions 1 – 6 on the worksheet. ☺

Now that you have looked at the slope, let's look at the y-intercept.

Select **New Sketch** from the **File** menu. Let's show some grid first (see instructions above).

Now, click on the **Point Tool** on the left hand side and create a point anywhere on the y-axis. Select **Translate** from the **Transform** menu. On the pop-up menu, click on Rectangular on the top. Enter 3 for Horizontal and 2 for Vertical (or any one-digit number that you want). Click **Translate**.

Select the **Arrow Tool** on the left hand side menu and click on any white space. Click on the point on the y-axis to highlight it and select **Ordinate (y)** from the **Measure** menu. Click on any white space.

3.3.4 Slopes and Stuff on GSP (Optional)
(continued)

Create a line with those two points (see instructions above). After you have created the line, click on any white space and then highlight the line. Select **Slope** from the **Measure** menu. Click on any white space and then highlight the line again.

Now as you move the line, look at the y-ordinate number and look at the slope value.

Answer questions 7 – 10 on the worksheet. ☺

Ok, a little bit more and the activity is done. But first, we need to create another line.

Click on the **Point Tool** on the left hand side again and create a point anywhere on the y-axis again. Select **Translate** from the **Transform** menu. On the pop-up menu, you should have your prior numbers on there already. If not, translate this point the same as your last point. Click **Translate**.

Again, click on the **Line Tool** on the left hand side and create a new line with the two new points that you have. Select the **Arrow Tool** on the left hand side, click on any white space, highlight the new line and **Measure** the **Slope** of the new line. Click on any white space.

Answer question 11 on your worksheet. ☺

Highlight Point A and Point B. **Measure** the **Coordinate Distance**. Click on any white space.

Measure the **Coordinate Distance** for Point A' and B' as well. Click on any white space.

Answer the rest of the questions on your worksheet. ☺

Picture source: http://www.wiley.com/college/musser/CL_0471263796_S/sketchpad/sketchpad_tutorial/

3.3.5 Slopes and Stuff on GSP – Optional Investigation

Worksheet for GSP

1. Describe the graph when the slope is greater than 1.	Draw an example.
2. What is the difference between the slope = 2 (approximately) and the slope = 6 (approximately)?	Draw slope = 2 on the left and draw slope = 6 on the right.
3. What happens when slope = 0?	Draw an example.
4. Describe the graph when slope is less than 0.	Draw an example.
5. What is the difference between slope = -2 and slope = -6?	Draw slope = -2 on the left and draw slope = -6 on the right.

3.3.5 Slopes and Stuff on GSP – Optional Investigation
(continued)

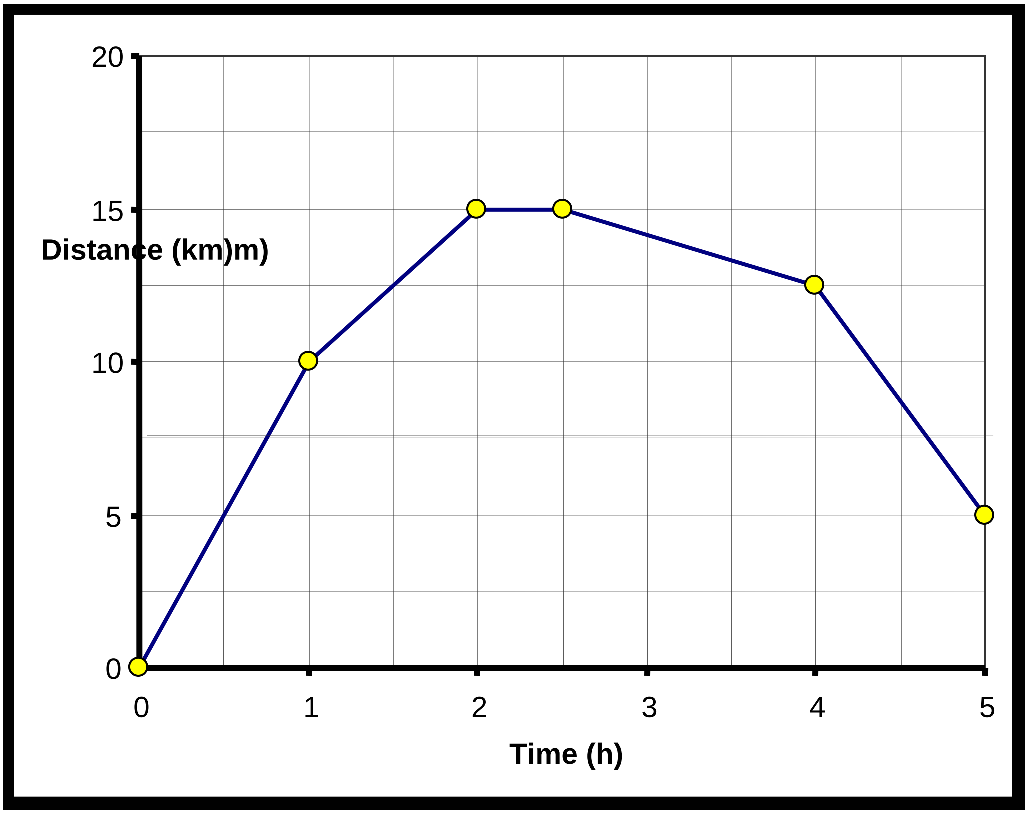
6. When you are changing the slope, what stayed the same?	
7. What happens when the y-ordinate = 5?	Draw an example.
8. What happens when the y-ordinate = -6?	Draw an example.
9. When you are changing the y-ordinate, what stayed the same?	
10. In the equation y = mx + b, which letter does slope represent? What about the y-ordinate?	

3.3.5 Slopes and Stuff on GSP – Optional Investigation
(continued)

11. What do you notice about these two lines?	
12. What do you notice about the two coordinate distances?	Write down the two coordinate distances here.
13. Because the two coordinate distances are the same, what does that mean about the two lines?	Was your hypothesis correct from question 11?

3.3.6 Slopes and Stuff - Practice

From the graph below, label each point with a name (A, B, etc.), name each slope, state whether the slope is positive or negative, calculate the slope and state any parallel slopes.



Slope: ____

Slope: ____

Slope: ____

Slope: ____

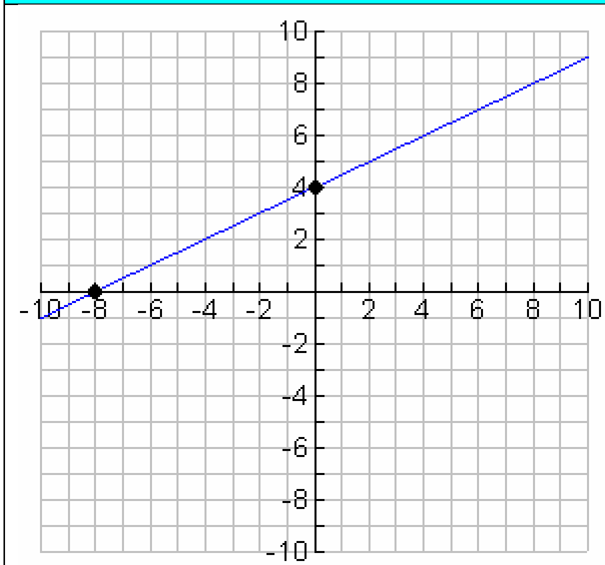
Slope: ____

Parallel slopes? ____________________________________

3.4.1 Graphs, Slopes, Intercepts, Equations and Check

One partner will find the y-intercept of each graph and the other partner will find the slope of each graph. You will both then create an equation that represents the graph. Finally, you will check your equation using the graphing calculator (use BLM 3.4.2 as a reference for your graphing calculator).

GRAPH A



Partner A

Slope = ______________________

Partner B

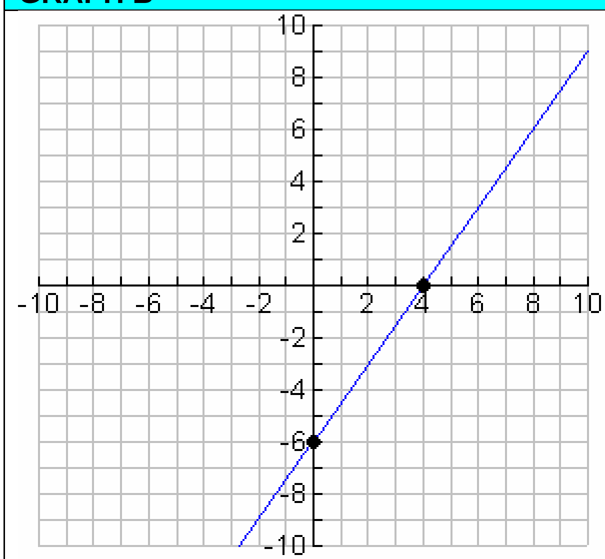
y-intercept = ______________________

Join both A and B to create an equation

Equation = ___________________________

Check you answer using the graphing calculator.

GRAPH B



Partner B

Slope = ______________________

Partner A

y-intercept = ______________________

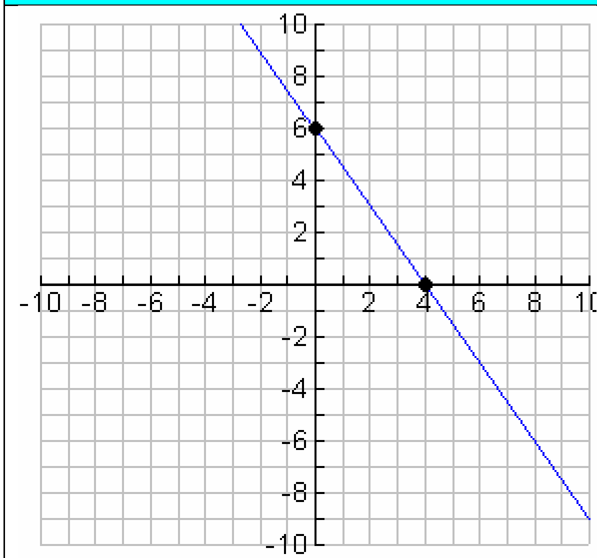
Join both A and B to create an equation

Equation = ___________________________

Check you answer using the graphing calculator.

3.4.1 Graphs, Slopes, Intercepts, Equations and Check
(Continued)

GRAPH C



Partner A

Slope = ______________________

Partner B

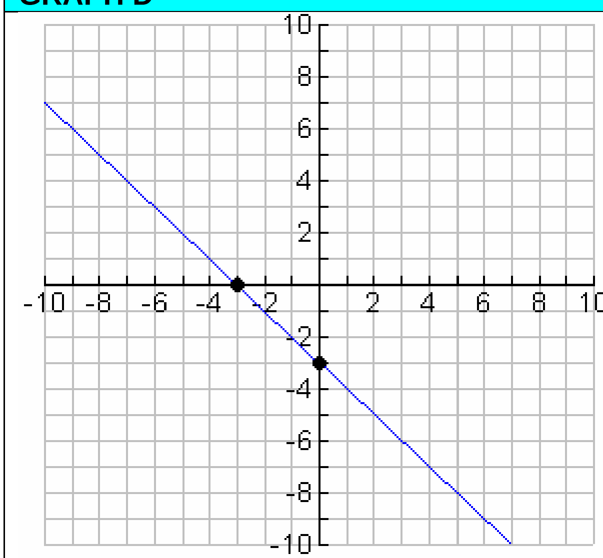
y-intercept = ______________________

Join both A and B to create an equation

Equation = ___________________________

Check you answer using the graphing calculator.

GRAPH D



Partner B

Slope = ______________________

Partner A

y-intercept = ______________________

Join both A and B to create an equation

Equation = ___________________________

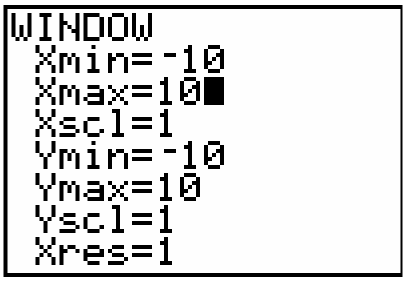
Check you answer using the graphing calculator.

3.4.2 Graphs, Slopes, Intercepts, Equations and Check: Graphing Calculator Keystrokes

1. Prepare your calculator by either running a get-ready program or resetting the graphing calculator.

2. Press the 

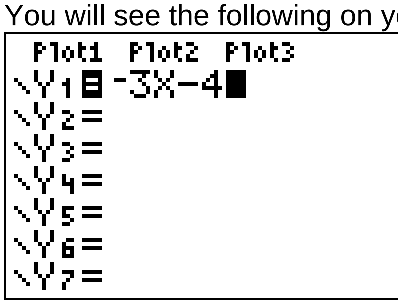
button and set the window setting as shown below:



3. To enter an equation for graphing press the 

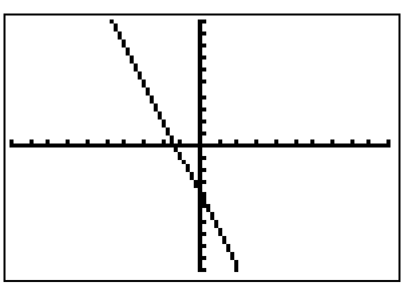
4. Enter your equation in Y1. For example, to graph y = -3x - 4 enter:

You will see the following on your screen



5. To view your graph press the 

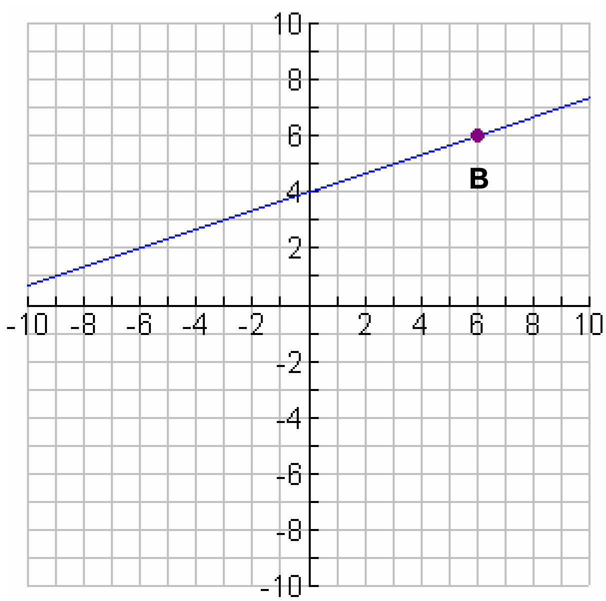
button. You will see the graph as shown below:



3.4.3 Can Graphing Get Any Easier?

Investigation 1

$$y = \frac{1}{3}x + 4$$



1. Start at the y-intercept.

2. Only moving up (+) or down (-), how many units do you need to reach the same level as point B? ________

3. Only moving right (+), how many units do you have to move your pencil to connect to point B? _____________

4. Given the equation for the graph state the slope and the y-intercept

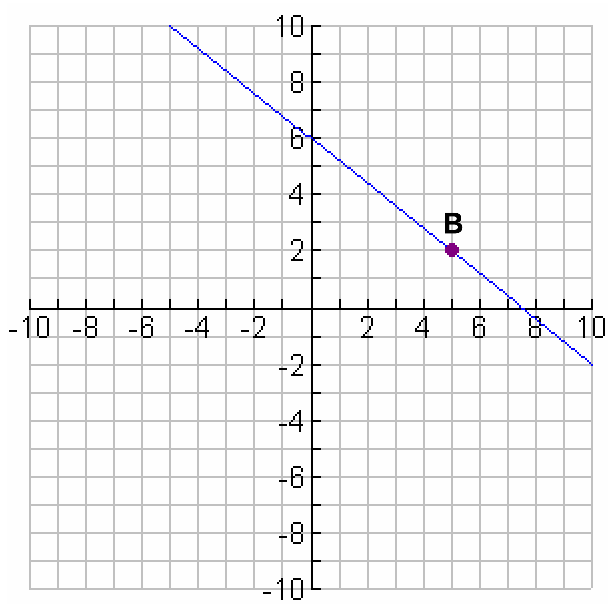
   Slope = ______________________

   y-intercept = __________________

3.4.3 Can Graphing Get Any Easier? (Continued)

Investigation 2

$$y = -\frac{4}{5}x + 6$$



1. Start at the y-intercept.

2. Only moving up (+) or down (-), how many units do you need to reach the same level as point B? ________

3. Only moving right (+), how many units do you have to move your pencil to connect to point B? _____________

4. Given the equation for the graph state the slope and the y-intercept

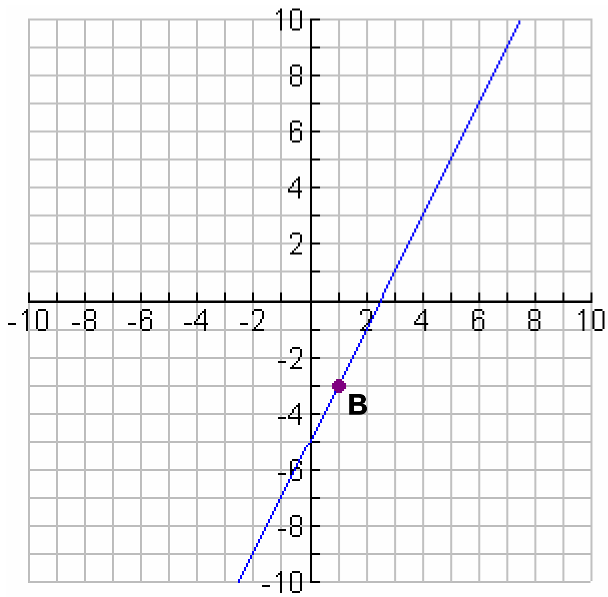
   Slope = ____________________

   y-intercept = ________________

3.4.3 Can Graphing Get Any Easier? (Continued)

Investigation 3

$$y = 2x + 5$$



1. Start at the y-intercept.

2. Only moving up (+) or down (-), how many units do you need to reach the same level as point B? ________

3. Only moving right (+), how many units do you have to move your pencil to connect to point B? _____________

4. Given the equation for the graph state the slope and the y-intercept

   Slope = ______________________

   y-intercept = _________________

3.4.3 Can Graphing Get Any Easier? (Continued)

Summary

Discuss each question with your partner and both partners write answers.

1. Looking at all three investigations, can you relate the values from steps 2 and 3 with the slope or the y-intercept? Explain the relationship.

2. Given the following equation:

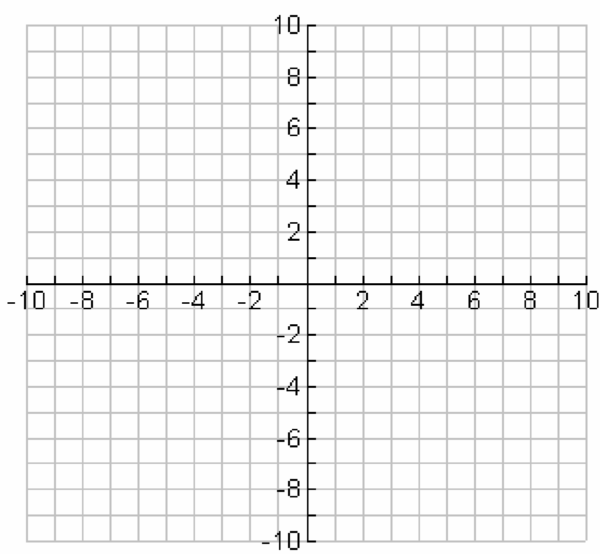
$$y = \frac{2}{3}x - 4$$

Slope: ____________________

y-intercept: ________________

Describe a method to graph this equation by hand using the slope and the y-intercept.

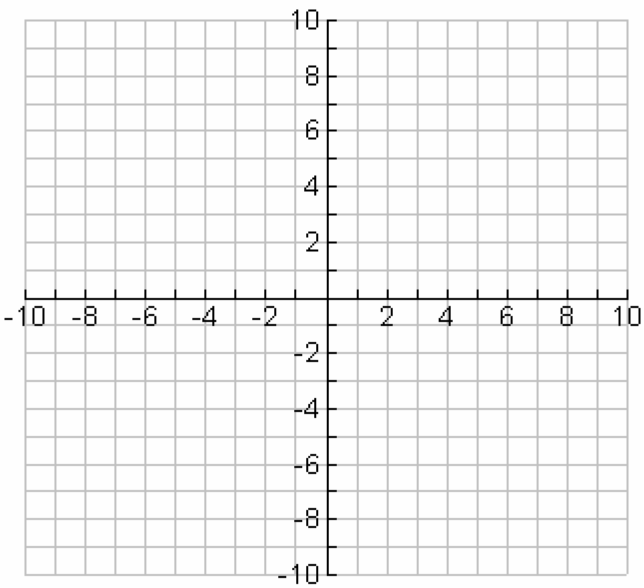
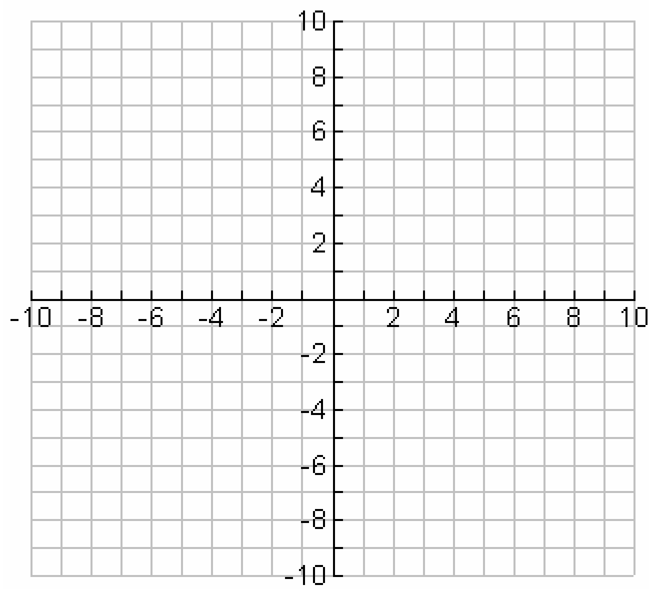
3. Using the grid provided below graph the equation $y = \frac{2}{3}x - 4$. Write the steps you followed to the right of your graph.



3.4.4 Rising and Running From a Point

Graph the following equations on the grids given below and check your graphs using the graphing calculator.

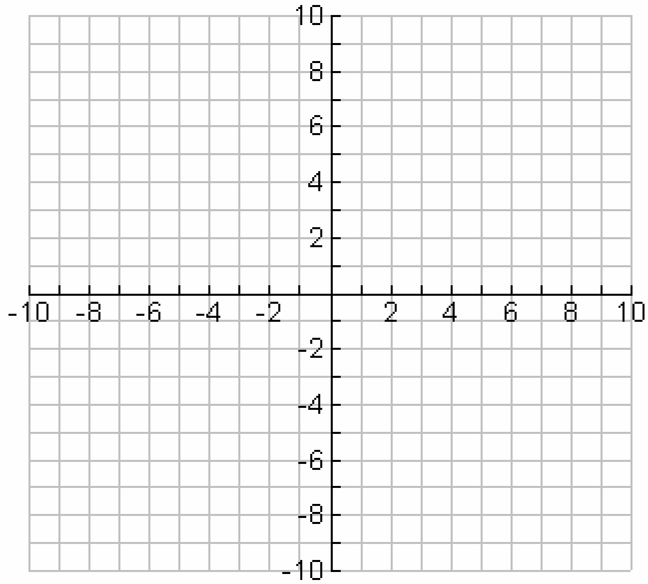
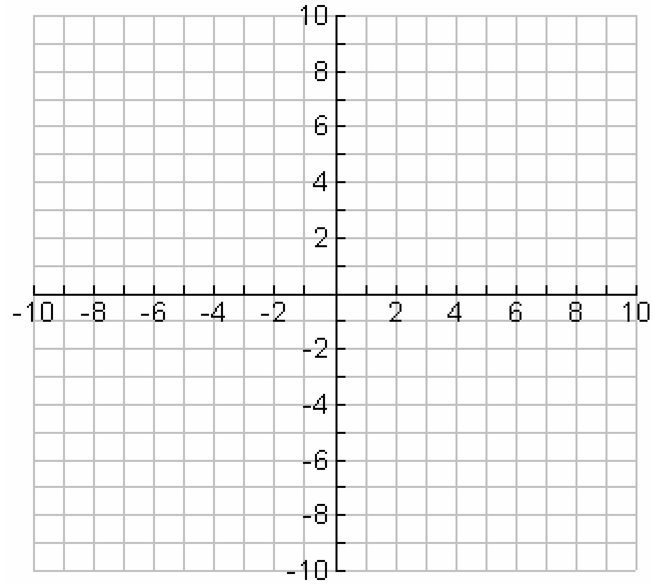
Note: When you write the slope as a fraction, any negative signs should be placed in the numerator only.

Equation 1	**Equation 2**
$y = \frac{2}{3}x - 4$	$y = -\frac{4}{3}x + 2$
Slope = Rise = Run = y-intercept =	Slope = Rise = Run = y-intercept =
Graph: 	Graph: 
Describe how you graphed the line.	Describe how you graphed the line.

3.4.4 Rising and Running From a Point (Continued)

Graph the following equations on the grids given below and check your graphs using the graphing calculator.

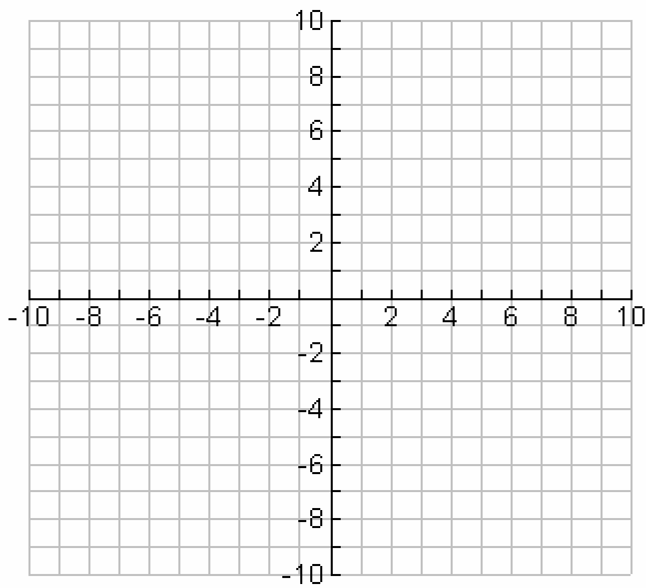
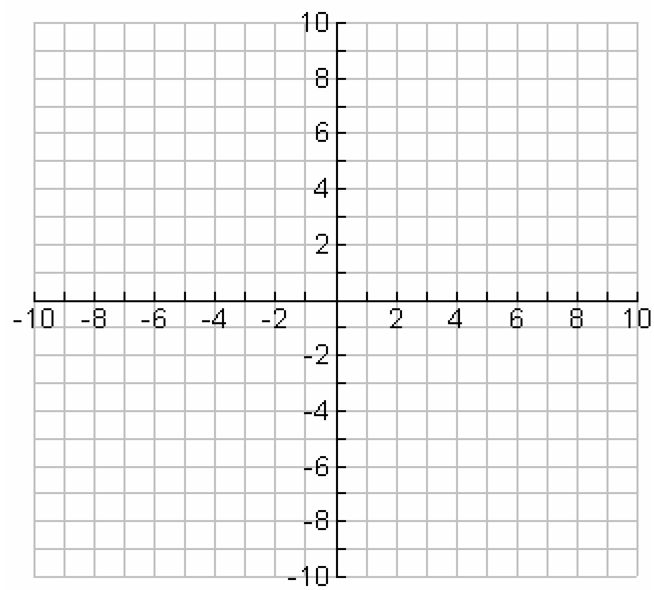
Note: When you write the slope as a fraction, any negative signs should be placed in the numerator only.

Equation 3	**Equation 4**
$y = 3x + 2$	$y = -x + 2$
Slope = Rise = Run = y-intercept =	Slope = Rise = Run = y-intercept =
Graph: 	Graph: 
Describe how you graphed the line.	

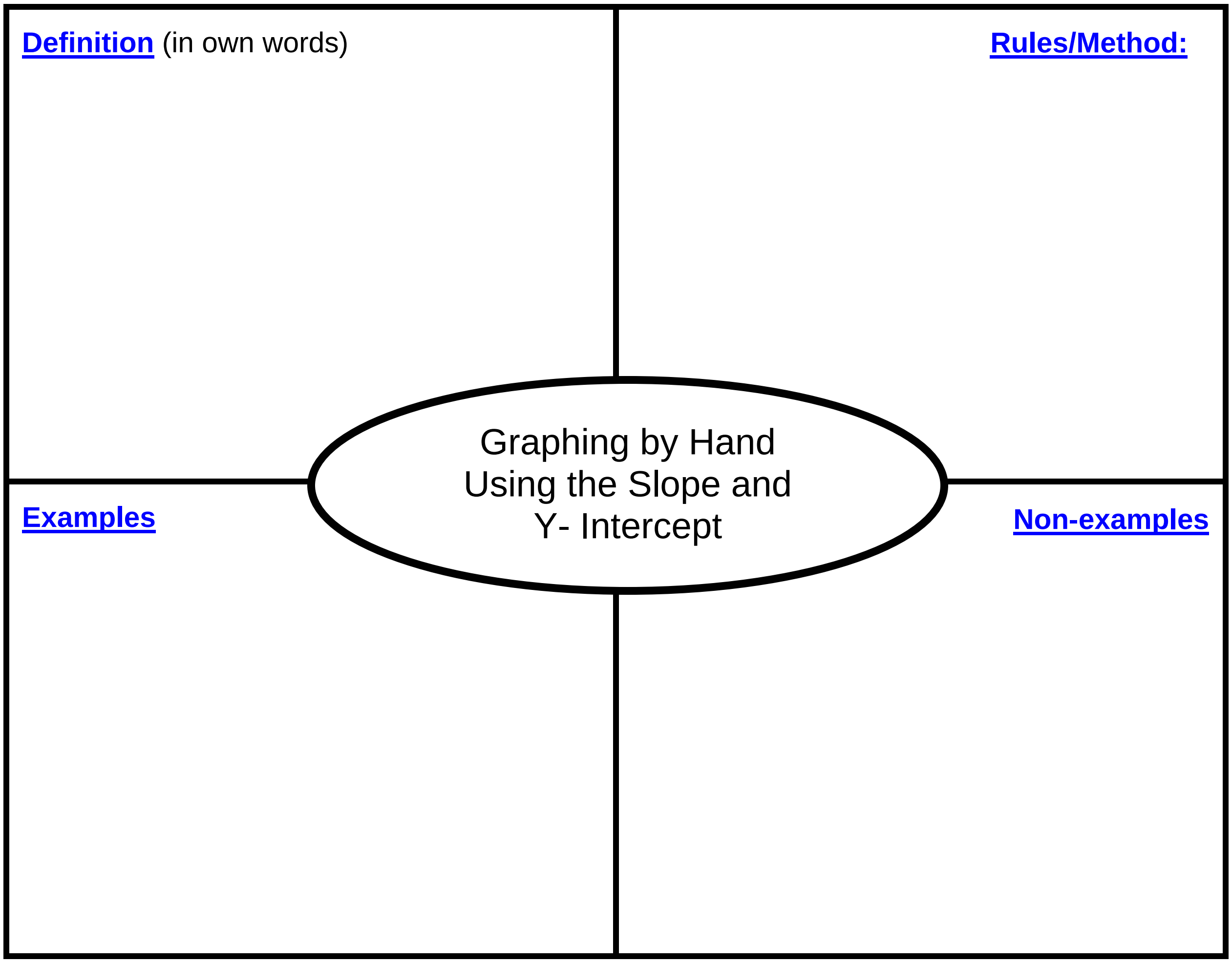
3.4.4 Rising and Running From a Point (Continued)

Graph the following equations on the grids given below and check your graphs using the graphing calculator.

Note: When you write the slope as a fraction, any negative signs should be placed in the numerator only.

Equation 5	**Equation 6**
$y = 2x$	$y = 3$
Slope = Rise = Run = y-intercept =	Slope = Rise = Run = y-intercept =
Graph: 	Graph: 
Describe how you graphed the line.	Describe how you graphed the line.

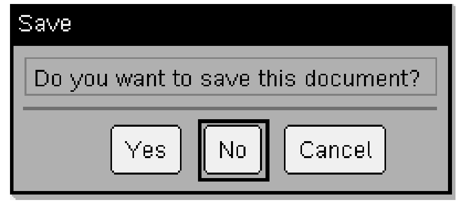
3.4.5: Graphic Organizer



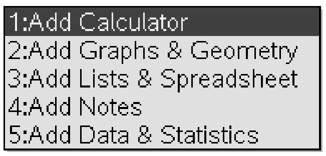
3.5.1: Nspire CAS Handheld Manual

Getting Started

When you turn on the handheld, press home 6.



You will be asked whether you want to save the document. Select **No**. To do this, use the large circular “navpad” to move to the right, then press the enter button.



Next select **1:Add Calculator**. To do this, press the 1 button.

You are now ready to use CAS on the handheld.

Some Helpful Shortcuts

If you make a mistake at any point that you want to undo, press ctrl Z.

If you undo something that you want back again, press ctrl Y.

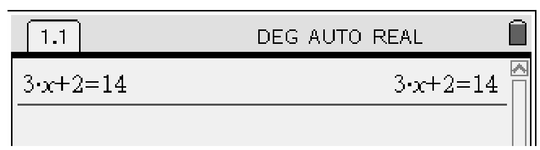
How to Solve for a One Variable Equation: Example One

Say that you wish to solve the equation **3x + 2 = 14**

To do this, first be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section above.

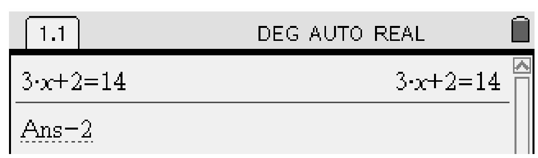
First type in the equation that you want to solve. Use the number pad and the green letter keys; the operations (÷, ×, -, +) are located on the right, and the equals sign (=) is in the top-left corner of the keypad. When you have typed in the equation, press the enter key, found in the bottom-right corner.

The top of your screen will look something like this:

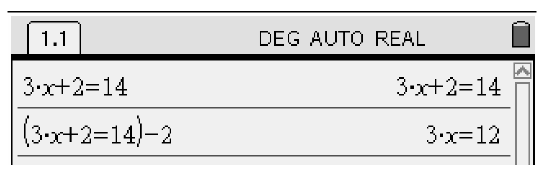


Now decide how you would start in solving for **x**.

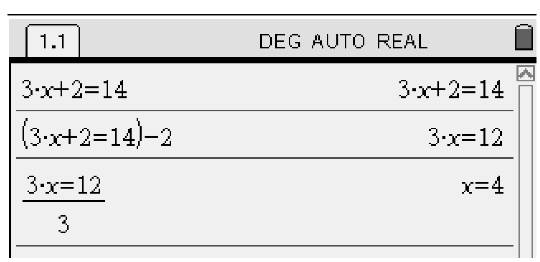
Perhaps you’ve decided that subtracting **2** from both sides of the equation is a good start. Wonderful! To do this, immediately press − 2. Notice that the handheld automatically inserts **Ans** . What is this?



Ans stands for the last answer you found. If you now press the enter key, the handheld will subtract **2** from the left side and the right side of **3x + 2 = 14**. You will see this result:



Continue solving the equation. You probably see that to finally isolate the **x** variable, it is necessary to divide the equation by **3** on both sides. Again, just start typing the operation you want to perform. Press ÷ 3. The handheld will insert **Ans** for you. Press enter to calculate the result.



As you can see, the handheld reports that **x=4**.

3.5.1: Nspire CAS Handheld Manual (Continued)

How to Solve for a Variable: Example Two

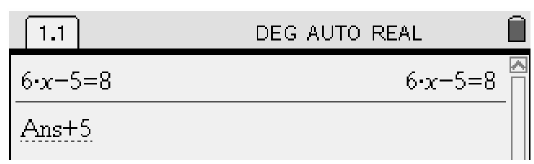
Say that you wish to solve the equation **6x - 5 = 8** for the variable y.

To do this, first be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section above.

First type in the equation that you want to solve. Use the number pad and the green letter keys; the operations (÷, ×, -, +) are located on the right, and the equals sign (**=**) is in the top-left corner of the keypad. When you have typed in the equation, press the enter key, found in the bottom-right corner.

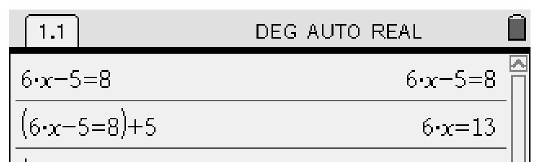
The top of your screen will look something like this:

Now decide how you would start solving for x.

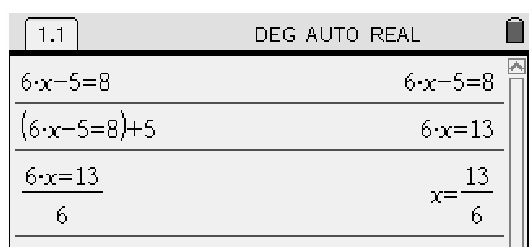


Perhaps you've decided that adding **5** to both sides of the equation is a good start. Wonderful! To do this, immediately press + 5. Notice that the handheld automatically inserts **Ans**. What is this?

Ans stands for the last answer you found. If you now press the enter key, the handheld will add 5 to the left side and the right side of **6x - 5 = 8**. You will see this result:



Continue solving the equation. You probably see that to finally isolate the **x** variable, it is necessary to divide the equation by **6** on both sides. Again, just start typing the operation you want to perform. Press ÷ 6. The handheld will insert **Ans** for you. Press enter to calculate the result.



As you can see, the handheld reports that $x = \dfrac{13}{6}$.

Is this the result you expected?

To convert this result to its decimal equivalent press ctrl enter

Now, try to solve the following equations on your own. Remember to start a new calculator screen for each one.

3x – 4 = -7

7 + 2x = 4

-2x + 8 = 3x + 3

3.5.1: Nspire CAS Handheld Manual (Continued)

How to Check a Solution to a One Variable Equation

Say that you have solved the following equation: **6x - 5 = 8**

and you believe the solution is $x = \frac{13}{6}$

This would be tedious to check by pencil and paper, but it is quick to check with the handheld.

Here is how to do it. First be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section from earlier in this manual.

Here is how to do it:

First type in the equation but do not press . The screen looks like:

Next, continue typing by pressing the grey key with the vertical line (in the top row). This symbol means "such that". Continue typing **x=13** **6**. The screen looks like:

When you press the handheld says **true** to indicate that the solution is correct. If the solution is not correct the handheld will return **false**.

Now, check your solutions to the three equations you solved on the previous page.

If there are any notes you want to make to help you remember how to solve and check equations use the box below.

3.5.2: Temperature Conversions - Investigation

Goal: With a partner you will investigate how to solve one variable equations that have fractional coefficients using CAS and pencil and paper.

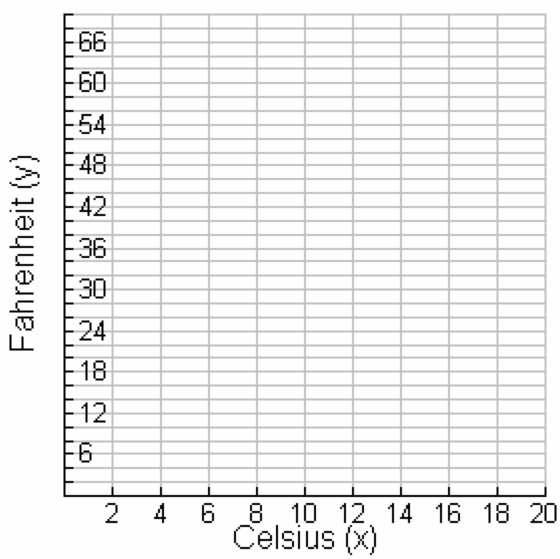
Nethead is planning to go to visit Wingman in Detroit. Wingman says that the temperature is 23º Fahrenheit. Nethead wants to know if he needs to packs warm clothing for his trip. How many degrees Celsius is 23º Fahrenheit?

We first need a formula that converts Celsius to Fahrenheit. Here's some info to help.

Temperature in Celsius (x)	Temperature in Fahrenheit (y)
0	32
20	68

1. What is the y-intercept? _____________

2. If we write the information as points (0, 32) and (20, 68), plot the two points and find the slope using a rate triangle.



Slope = $\frac{rise}{run}$ =

(Write the slope as a fraction in reduced form.)

3. Now that we know the y-intercept and slope, state the equation relating Celsius (**x**) to Fahrenheit (**y**).

4. Using your equation convert the following two temperatures in degrees Celsius to degrees Fahrenheit.
   a) 10º   b) 30º

3.5.2: Temperature Conversions - Investigation (Continued)

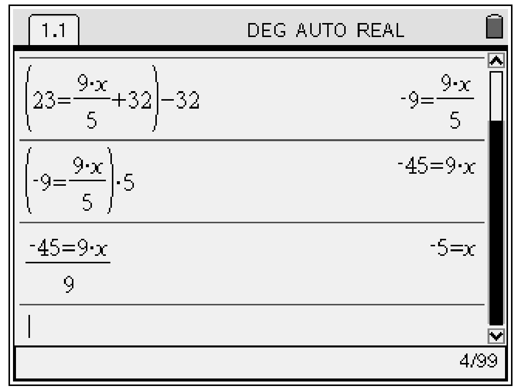
Lets help Nethead now: How many degrees Celsius is it if its 23º Fahrenheit?
(**Hint**: Substitute 23 for **y** and solve the equation for **x** using the Nspire CAS handheld.)

When you enter the equation it will look like:

First subtract **32** from both sides

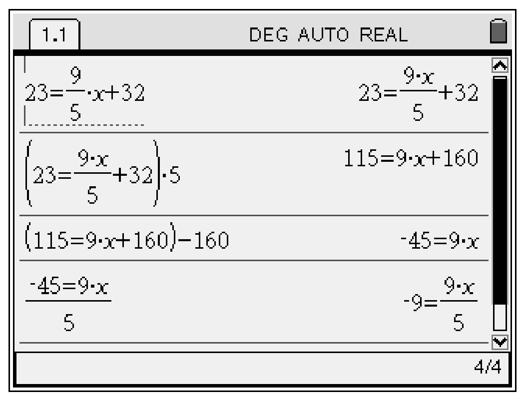
Remember that $\frac{9x}{5}$ means **x** multiplied by **9** and divided by **5**. So, you have to do the opposite of each of the two operations to solve for **x**.

Your screen will look like:



So 23° Fahrenheit is -5° Celsius.

If we could get rid of the fractions in the equation first you could solve the equation without using CAS. Enter the original equation $23=\frac{9x}{5}+32$ again and multiply by **5**, then subtract and divide to solve. Your solution looks like:



Comparing the two solutions you can see the second one could be done without CAS.

5. Convert the following two temperatures in degrees Fahrenheit to degrees Celsius by solving the equation by pencil and paper first and then checking your solution using CAS.
   a) 5º b) 83º c) -10º

3.5.3: Temperature Conversions - Practice

1. Solve the following equations using pencil and paper.

a) $\frac{5x}{3} - 4 = 6$	b) $\frac{1}{2}x - 5 = 11$	c) $\frac{4}{5} = \frac{2}{3}x + 6$ **Hint:** Multiply each term by the common denominator

2. Typing Speed: The formula for calculating typing speed is

$s = \frac{w}{t} - \frac{10e}{t}$ where $\left\{ \begin{array}{l} s \text{ is the speed} \\ w \text{ is the number of words} \\ t \text{ is the time in minutes} \\ e \text{ is the number of errors} \end{array} \right.$

a) Nethead types 250 words in 15 minutes with 9 errors. Calculate his typing speed.

b) Wingman types 500 words in 5 minutes and has a typing speed of 72 words per minute. How many errors did he make?

3.6.2 Can You Stop The Fire?

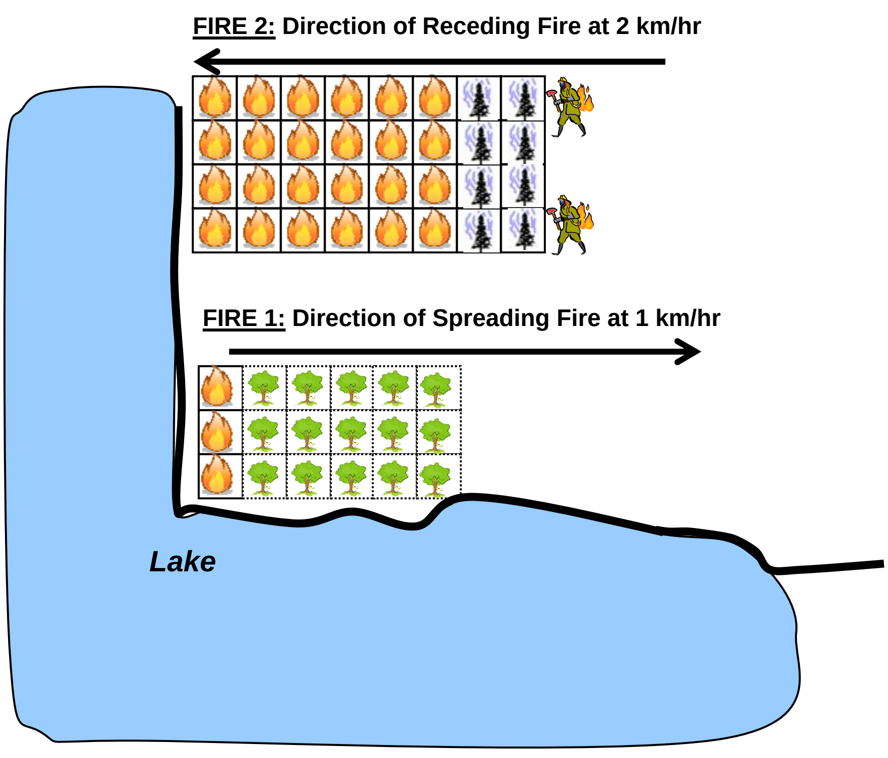
PROBLEM:

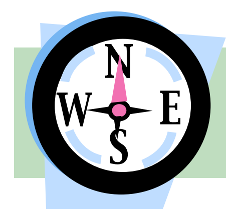
You work for the Ministry of Natural Resources as a Fire Fighting supervisor. You arrive in Dryden Ontario where you find two fires burning.

- The first fire has just started along 3 km of shoreline beside a lake and is moving **east** at a rate of **1 km/hr**.
- The second fire is also rectangular in shape and is being extinguished to the **west** by fire fighters at a rate of **2 km/hr**.
- Both fires can only change east or west. They will not get wider or narrower.

The picture below shows how the fires looked at the moment you arrived.

Note: Each square = 1 km^2





Did you read carefully?

The first fire is on the bottom.

3.6.2 Can You Stop The Fire? (Continued)

Questions:

1. Use the linking cubes to create models that represent the area of both fires at 0, 1, 2 and 3 hours. Each cube represents 1 km^2. Use different colours for the "contained fire" model and the "spreading fire" model.
2. Complete the tables below.

FIRE 1: The Spreading Fire			
Time	**h (km) (Height)**	**w (km) (Width)**	**A (km^2) (Area)**
0	3	1	
1	3		
2			
3			
4			
5			

FIRE 2: The Receding Fire			
Time	**h (km) (Height)**	**w (km) (Width)**	**A (km^2) (Area)**
0	4	6	
1	4		
2			
3			
4			
5			

3. What variable is the x-variable (independent) (Circle one): **Time** or **Area**
4. What variable is the y-variable (dependent) (Circle one): **Time** or **Area**
5. What is the y-intercept (initial value) of both fires:

   a. y-intercept of Fire 1:______________________

   b. y-intercept of Fire 2:______________________

6. For both sets of data, graph the time vs. the Area of the fires on the grid on the next page and draw lines of best fit for each set of data. Use different colours for each line. Label both axes and each line.

3.6.2 Can You Stop The Fire? (Continued)

7. Using the graphs, or the tables, determine the slope (rate of change) of both fires.

   a. Slope of Fire 1:____________________

   b. Slope of Fire 2:____________________

8. Using the graphs, what is the area of the fires at 6 hours?

   a. Area of Fire 1:_____________________

   b. Area of Fire 2:_____________________

3.6.2 Can You Stop The Fire? (Continued)

9. Using the values of the slopes and y-intercepts, write an equation of both fires in the form of **y = mx + b**:

    a. Equation of Fire 1:____________________

    b. Equation of Fire 2:____________________

10. Using the regression function of the graphing calculator, check to see if your equations are correct.  (See 3.6.3 for details.)
11. Using the graphing calculator, check to see if your graphs are correct by graphing both equations.  (See 3.6.3 for details.)
12. Using the equations, find the areas of both fires at 6 hours. Compare your answers to the answers from question 9.

    Show work for Fire 1

    Area of Fire 1 at 6 hours: ____________________

    Show work for Fire 2

    Area of Fire 1 at 6 hours: ____________________
13. Looking at both graphs, do the lines ever meet? (Circle one) **Yes** or **No**
14. If the lines meet, at what time and area does it occur?

    a. Time: ________________

    b. Area of Fire:____________

15. Explain the significance of this point in this context.

3.6.3 Can The Graphing Calculator Stop the Fire?

Determining the Equation of a Line

1. Prepare your calculator by either running a get-ready program or resetting the graphing calculator.

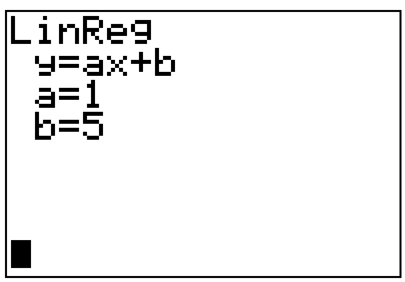
2. Enter the data into the list of the calculator be pressing STAT 1. Enter the time for into **L1** and the area of the fire into **L2**

3. Once all the data has been entered the calculator will perform linear regression to determine the equation of the line of best fit.

4. To determine the equation for the line of best fit press STAT ⟩ 4

5. Press 2nd 1 , 2nd 2 to state the two lists to use. Your screen will look like:

6. Now press ENTER to generate the equation. Your screen will show results similar but with different values as below:



   Note: **a** represents the slope.

7. In this case your equation would be: y = 1x + 5 or y = x + 5

3.6.3 Can The Graphing Calculator Stop the Fire? (Continued)

Determining the Equation of a Line

8. To view the graph of the data and graph you must first enter the equation of the line in Y1 by pressing [Y=]

9. Next enter the equation from above into Y1: [X,T,Θ,n] [+] [5] for y = x + 5

10. Change the window settings as illustrated below be pressing [WINDOW]

```
WINDOW
 Xmin=-5
 Xmax=15
 Xscl=1
 Ymin=-10
 Ymax=30
 Yscl=1
 Xres=1
```

11. Now to view the graph press [GRAPH]

12. Compare with the graph you made earlier by hand. If they are different check for errors.

3.6.4 Modelling Problems Algebraically

Piggy Bank Math

Little Johnny has three dollars to put into his brand new piggy bank. He will deposit his entire two-dollar per week allowance into his piggy bank.

a) Create a table that shows how much little Johnny will have over the first three weeks.

Weeks	Balance
0 (today)	3
1	
2	
3	

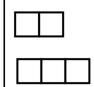
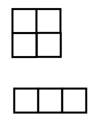
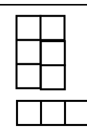
b) Create an equation in the form of y = mx + b from the data above.

c) He wants to buy a pet fish that he will name “Ernie” by Christmas, that is, in 9 weeks. Will he have enough money to buy Ernie if he costs $23

d) Little Johnny is also considering saving up for a new bike that costs $127. If he does not buy the fish, how long will it take until he has saved up enough to buy the bike?

Patterns in Area

Consider the following patterns created with unit cubes

Shape #	Picture	Total Area
1		
2		
3		
4		

a) Fill in the picture of 4^{th} shape.

b) Fill in the Total Area Column

c) Create an equation in the form of y = mx + b from the data above.

d) Using your equation, what will the area of 12^{th} figure be? Show your work.

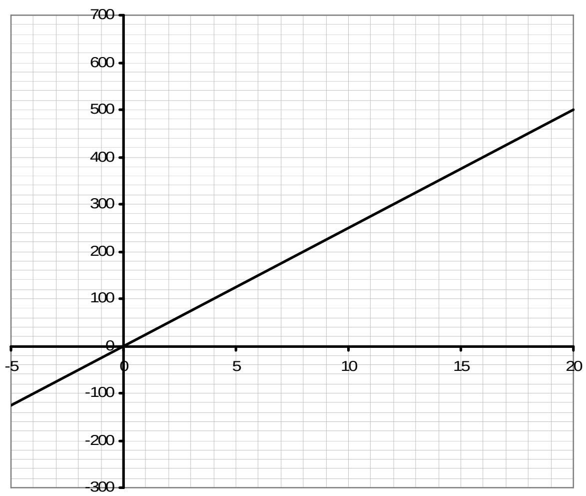
e) How many shapes would you have to build to have 139 cubes? Explain.

3.6.4 Modelling Problems Algebraically (Continued)

The Mechanic Problem

A mechanic earns $25 per hour

a) The graph below illustrates hours worked versus earnings.



b) Label the axis in the graph above.

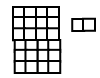
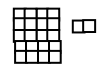
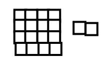
c) Create an equation in the form of $y = mx + b$ from the data above.

d) How much will the mechanic earn after 40 hours

e) How many hours must the mechanic work if she earns $1240?

Patterns in Area

Consider the following patterns created with unit cubes

Shape #	Picture	Total Area
1		
2		
3		
4		

a) Build the first, second, third and fourth shapes with the cubes. Fill in the picture of the 4th shape.

b) Fill in the Total Area Column

c) Create an equation in the form of $y = mx + b$ from the data above.

d) What will the area of 7th figure be? Show your work.

e) Can you build the 8th figure? Explain.

3.6.6 Practising Modelling

Part A: Complete the following table

#	Context	Equation in: y = mx + b	Problem
1	A caterer charges a flat fee of \$400 plus \$15/person.		Find the cost after 30 people
2	An internet package charges a flat fee of \$10 plus \$0.40 per hour.		Find the number of hours of internet usage if the cost is \$200.
3	The temperature of hot water placed in the freezer is 80° C and it is decreasing at the rate of 8° C per hour.		Find the temperature after 13 hours.
4	A tree`s diameter grows by $1\frac{3}{4}$ cm per year. The tree`s diameter is currently 12 cm.		Find how many years it will take have diameter $20\frac{3}{4}$ cm.
5	A spring is 14 cm long with no mass on it and it grows by 3 cm per kg put on it.		Find how much weight was added if the spring is 35 cm long.

Part B: For each equation, create a real world context. Identify the independent variable (**x**) and dependent variable (**y**) for each.

1. $y = 15x$ ______________________________

____

2. $y = 0.05x + 25$ ______________________________

____

3. $y = 20x – 100$ ______________________________

____

3.7.1 Y the X Are You Intercepting Me?

On the grid paper on the next page plot and label all the points listed below.
(**Note**: Each point is labelled so you can refer to them later.)

A(3,3)	B(2,3)	C(1,3)	D(0,3)	E(-1,3)	F(-2,3)
G(-3,3)	H(3,2)	I(3,1)	J(3,0)	K(3,-1)	L(3,-2)
M(3,-3)	N(-3,2)	O(-3,1)	P(-3,0)	Q(-3,-1)	R(-3,-2)
S(-3,-3)	T(2,-3)	U(1,-3)	V(0,-3)	W(-1,-3)	X(-2,-3)

Now, read the following carefully. There are three columns given: starting point, ending point and slope.

- If you have the starting point and slope, you have to state the ending point.
- If you have the ending point and slope, you have to state the starting point.
- If you have the starting point and ending point, you have to state the slope.

Starting Point	Ending Point	Slope
G		-1/6
F		-2/5
E	J	
O		-4/3
	X	-6
Q	T	
B	M	
D	K	
N		-5/2
R	M	
C		-5/2
P	U	
G	A	
S	M	
G	S	
A	M	

Making the picture:
Connect each starting point to each ending point.
What type of shape is created?

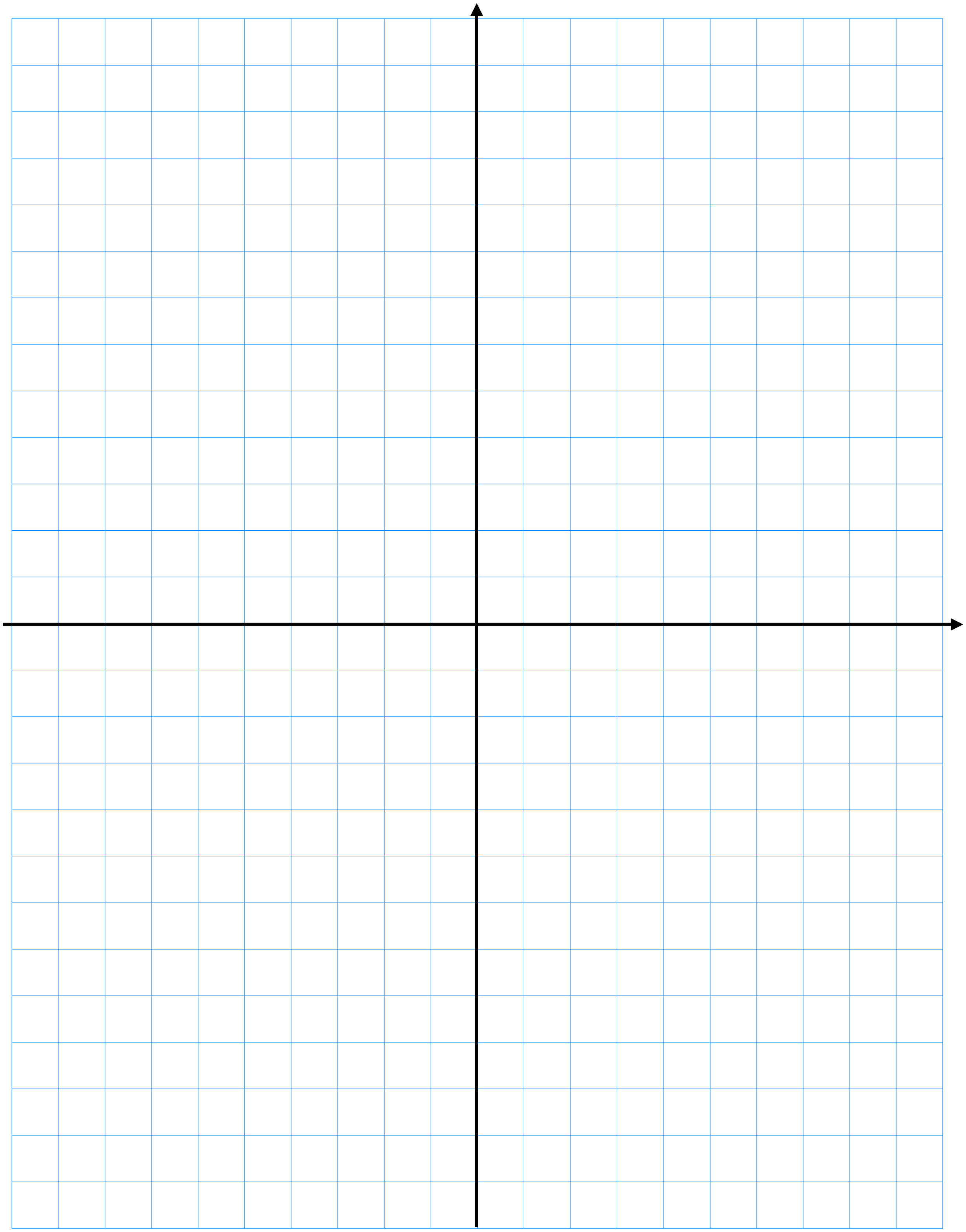
State the y-intercepts:

____

State the x-intercepts:

____

3.7.1 Y the X Are You Intercepting Me? (Continued)



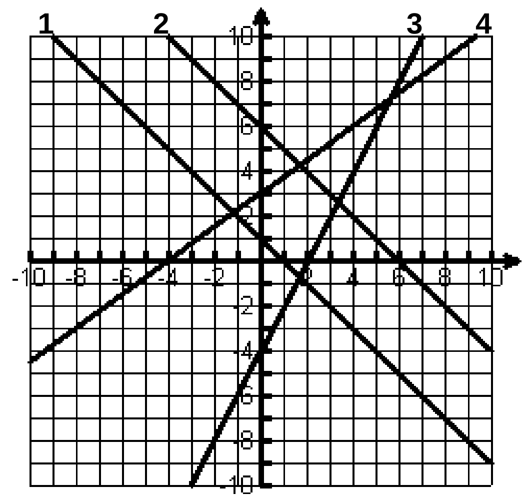
3.7.3 Y the X Are You Intercepting Me - Practice

Answer the following questions based on the lines graphed below.

1. Which lines have positive slopes?

2. Which lines have negative slopes?

3. Fill in the table by listing the coordinates for the x-intercepts and y-intercepts.



Line	*x*-intercepts	*y*-intercepts
1		
2		(0, 6)
3		
4	(-4, 0)	

4. Write the equation for line #1.

5. Write the equation for line #2.

6. Write the equation for line #3.

7. Write the equation for line #4.

3.7.3 Y the X Are You Intercepting Me - Practice (Continued)

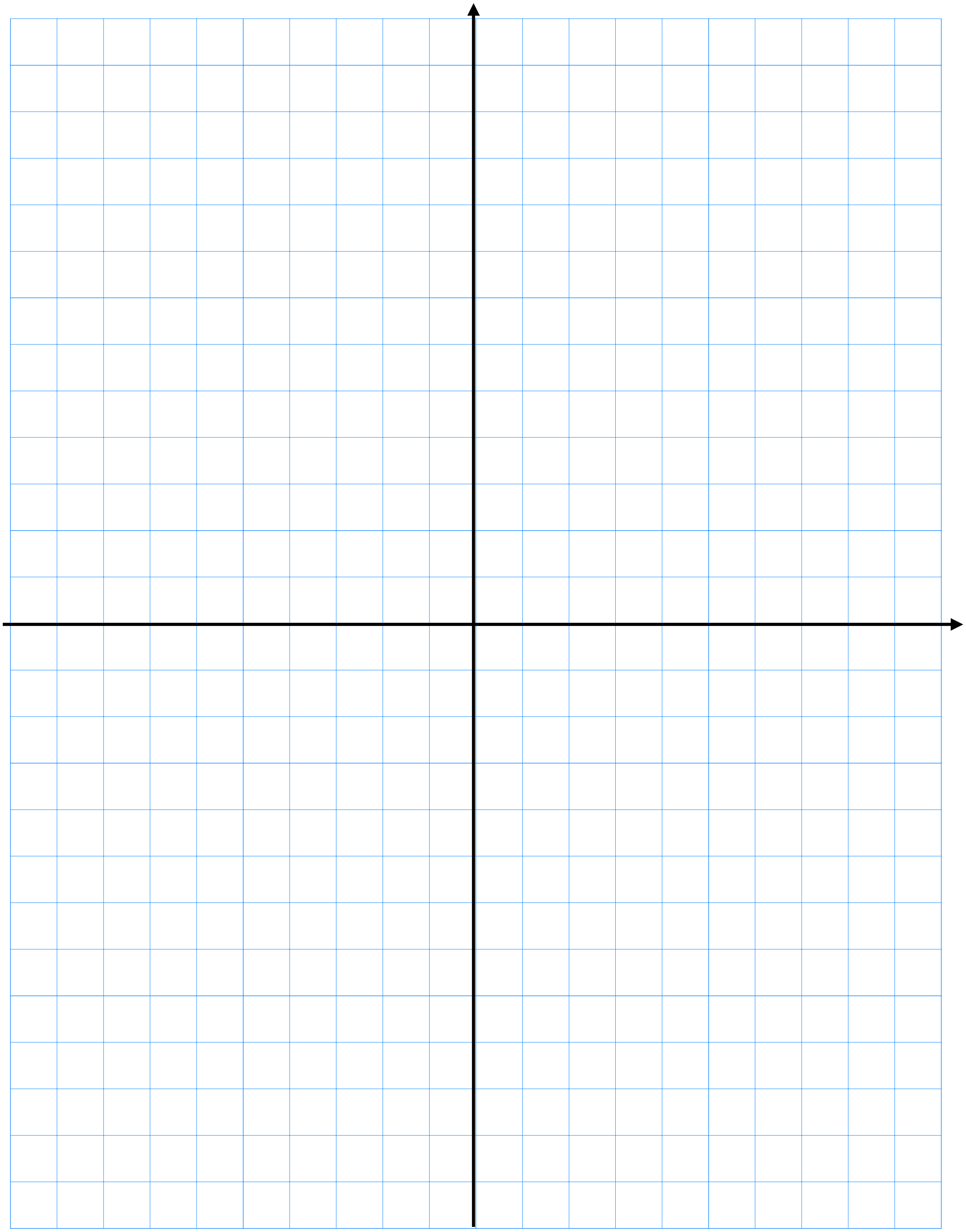
8. Calculate the x and y-intercepts and graph each line on the graph paper on the next page.
   a) $3x - 2y - 6 = 0$

   b) $5x + 2y - 10 = 0$

   c) $3x - y - 9 = 0$

   d) $2x - 5y - 14 = 0$

3.7.3 Y the X Are You Intercepting Me - Practice (Continued)



3.8.1 Writing Equations of Lines

Working with Another Form

Some Review

1. What is the slope and y-intercept for each line?

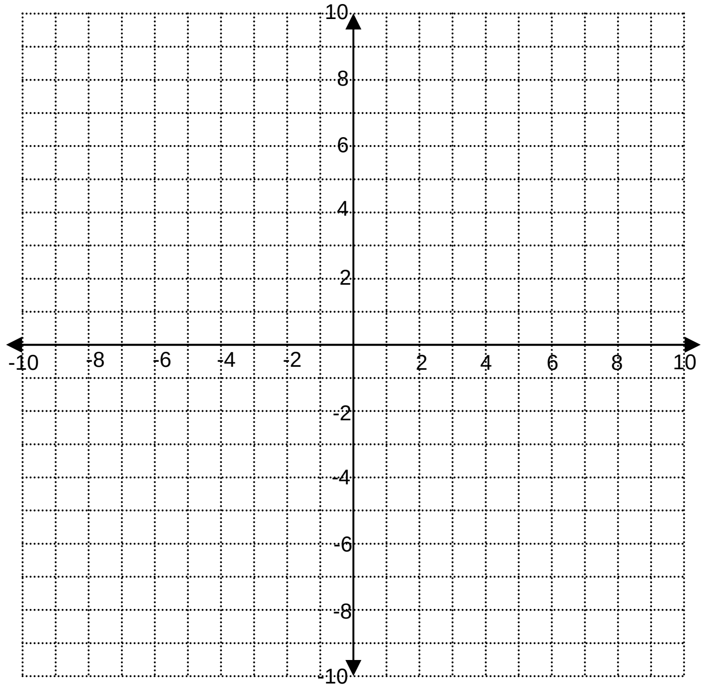
   a) $y = -3x + 1$

   m = ________ b = _________

   b) $y = \frac{3}{4}x - 3$

   m = ________ b = _________

2. Using this information, graph each of the equations on the grid below. Use a different colour for each line and label each line.



3. Let's look at another two equations.

   a) $3x + y - 1 = 0$

   b) $3x - 4y - 12 = 0$

What are two things you notice are different about these equations when you compare them to the equations in #1?

REMINDER:
You can only read the slope and y-intercept from the equation of a line if it is in ***y = mx + b*** form.

3.8.1 Writing Equations of Lines (Continued)

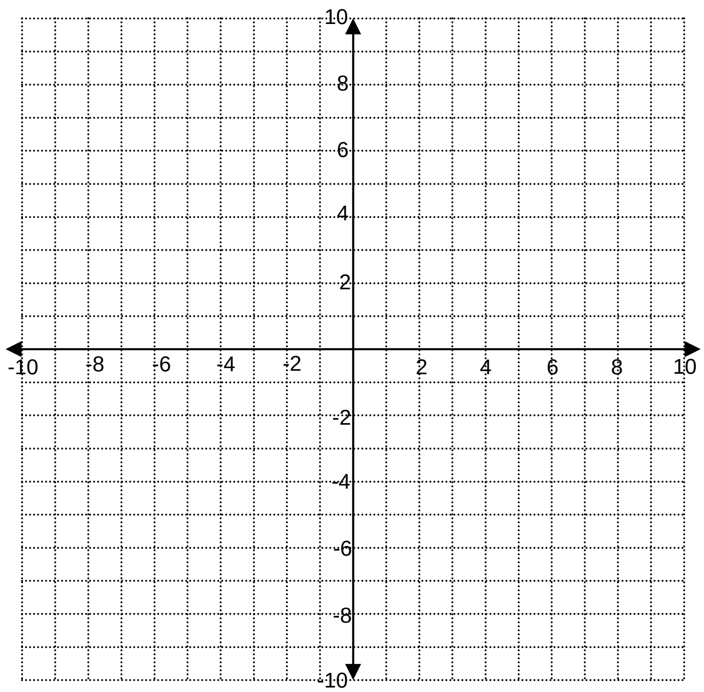
4. Calculate the x-intercept and the y-intercept. Then graph the equations on the grid below. Use a different colour for each line and label each line.

   a) $3x + y - 1 = 0$ b) $3x - 4y - 12 = 0$

Practice:

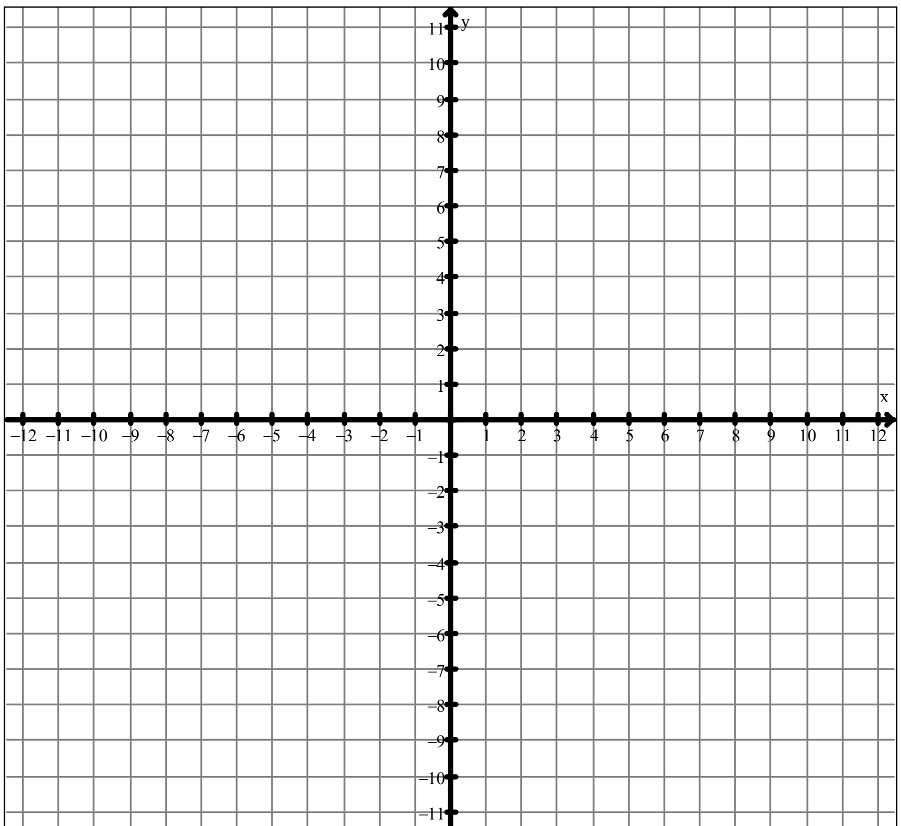
5. For each equation:
   - Calculate the x-intercept and the y-intercept.
   - Graph on the grid provided. Use a different colour for each line and label each line.

   a) $2x + y - 4 = 0$ b) $4x + 2y + 6 = 0$



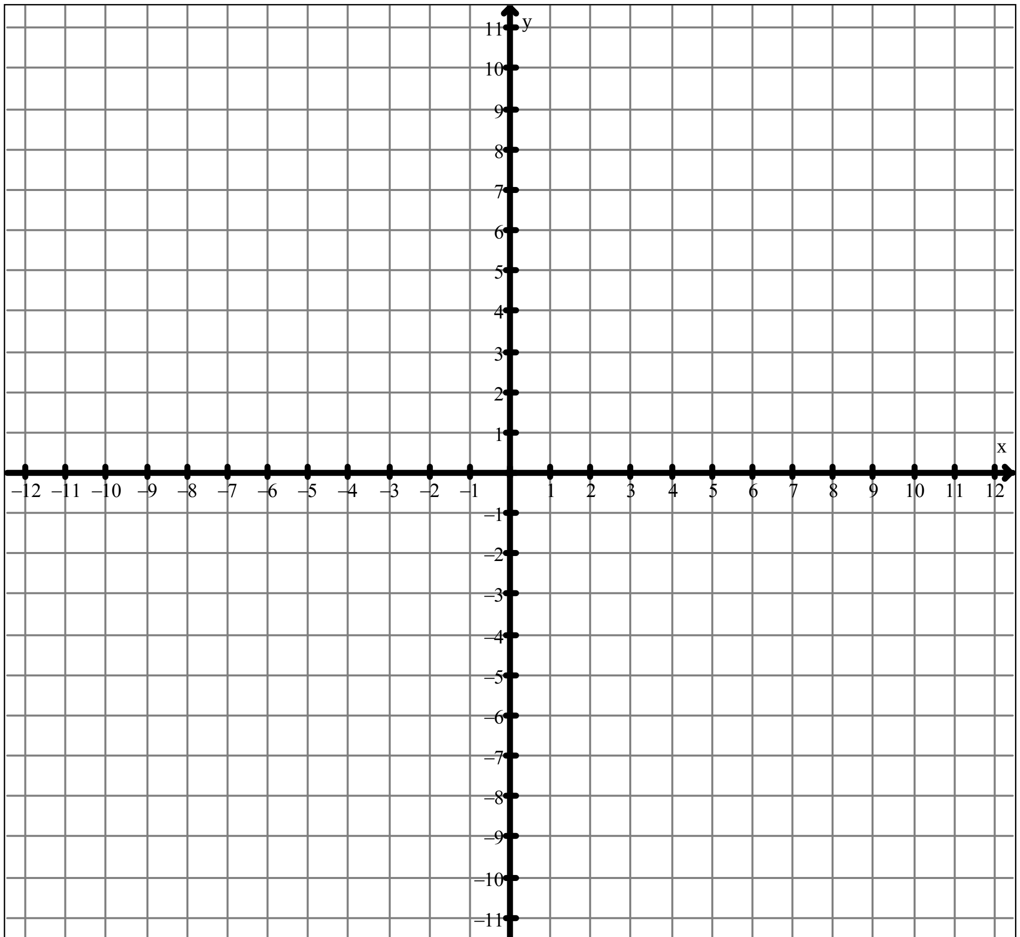
3.8.2: Jack and Jill Go up a Hill

For each of the following questions
a) Plot the points on the given grid.
b) Draw a line connecting the points
c) Calculate the rise by counting squares. Calculate the rise again by using the coordinates of the points. Show your work to confirm your answers. (The first one is done for you).
d) Calculate the run by counting squares. Calculate the run again by using the coordinates of the points. Show your work to confirm your answers.
e) Calculate the slope. (rate of change)



1. A (0, 3) B (2, 0)	2. C (-2, 0) D (0, 5)	3. E (3, 0) F (0, -7)	4. G (0, 0) H (7, 0)
Rise: 3 – 0 = 3 Run: 0 – 2 = -2 $Slope = \frac{Rise}{Run}$	Rise: Run: $Slope = \frac{Rise}{Run}$	Rise: Run: $Slope = \frac{Rise}{Run}$	Rise: Run: $Slope = \frac{Rise}{Run}$

3.8.2: Jack and Jill go up a Hill (Continued)



Reminder: Vertical lines do not have a slope. The slope is undefined.

5. A (2, 3) B (5, 0)	6. C (-2, 1) D (3, 5)	7. E (2, 1) F (3, 6)	8. G (-3,-3) H (-3, 7)
Rise: Run: $Slope = \frac{Rise}{Run}$	Rise: Run: $Slope = \frac{Rise}{Run}$	Rise: Run: $Slope = \frac{Rise}{Run}$	Rise: Run: $Slope = \frac{Rise}{Run}$

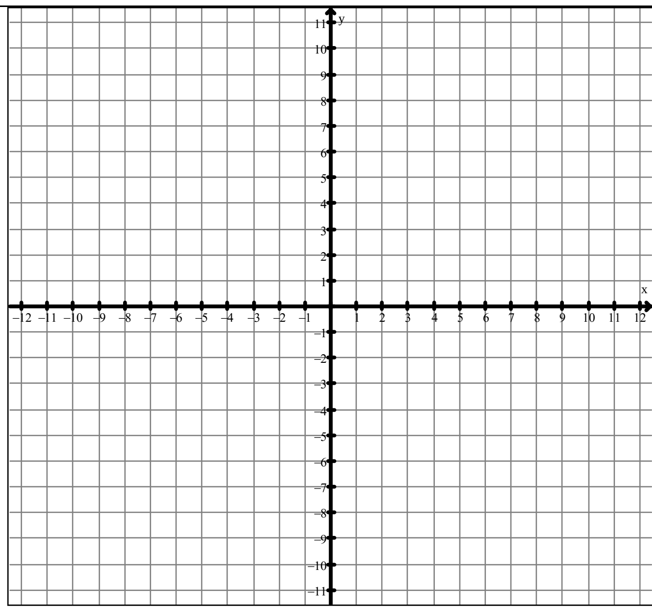
Describe in your own words how you would calculate the slope of a line given two points without using a graph.

3.8.3: Slopes "A" way

A Coaches B	B Coaches A
9. A (25, 30) B (35, 20)	**10. E (-13, -23) F (31, 17)**
$Slope = \frac{Rise}{Run}$	$Slope = \frac{Rise}{Run}$
11. G (32, 21) H (-3, -16)	**12. A (7, 40) B (11, 81)**
$Slope = \frac{Rise}{Run}$	$Slope = \frac{Rise}{Run}$
13. E (3, 33) F (2, 27)	**14. G (-200, -100) H (30, -6)**
$Slope = \frac{Rise}{Run}$	$Slope = \frac{Rise}{Run}$
15. E (-12, -15) F (-20, -4)	**16. E (5, -6) F (15, 8)**
$Slope = \frac{Rise}{Run}$	$Slope = \frac{Rise}{Run}$

3.8.4: Writing Equations of Lines

For each of the following questions:
1. Plot the points on the given grid.
2. Draw a line connecting the points and extend the line in both directions to the edge of the graph.
3. Calculate the slope (rate of change) using a formula. Compare your answer with your graph.
4. Using the graph state the y-intercept.
5. Write the equation of the line in slope y-intercept form.
6. Verify your equation using a graphing calculator.

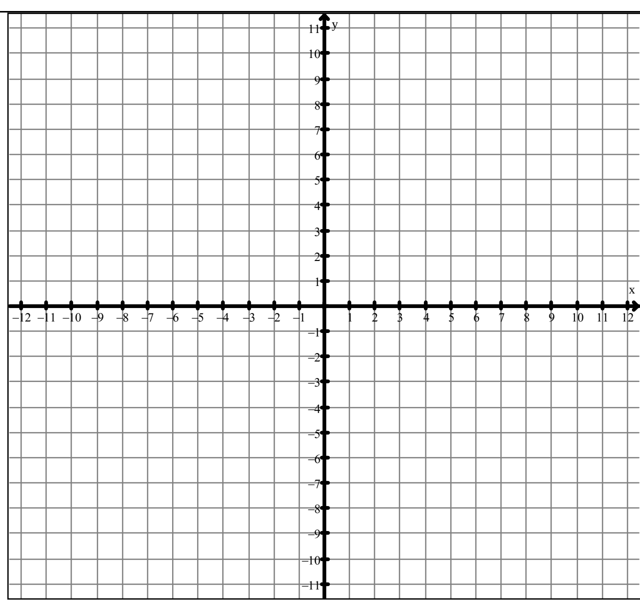


1. A (0, 8) B (8, 0)

$$Slope = \frac{Rise}{Run}$$

y-intercept =

Equation:



2. A (2, 4) B (4, 5)

$$Slope = \frac{Rise}{Run}$$

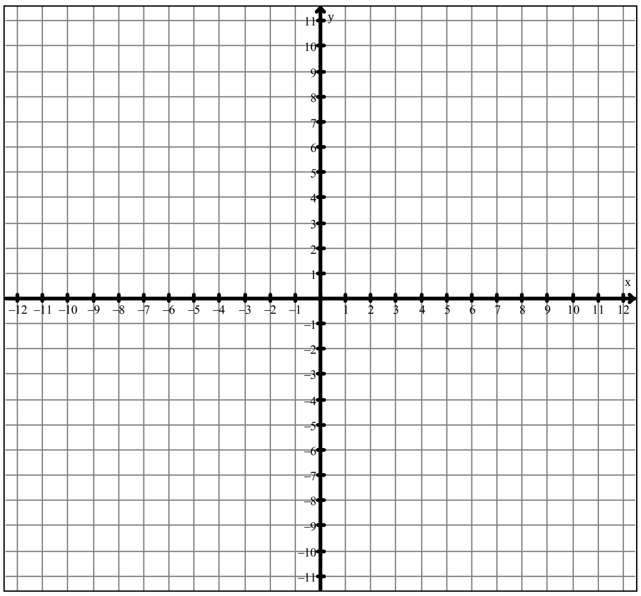
y-intercept =

Equation:

3.8.4: Writing Equations of Lines (Continued)

For each of the following questions:

1. Plot the points on the given grid.
2. Draw a line connecting the points and extend the line in both directions to the edge of the graph.
3. Calculate the slope (rate of change) using the formula. Compare your answer with your graph.
4. Using the graph state the y-intercept.
5. Write the equation of the line in slope y-intercept form.
6. Verify your equation using a graphing calculator.

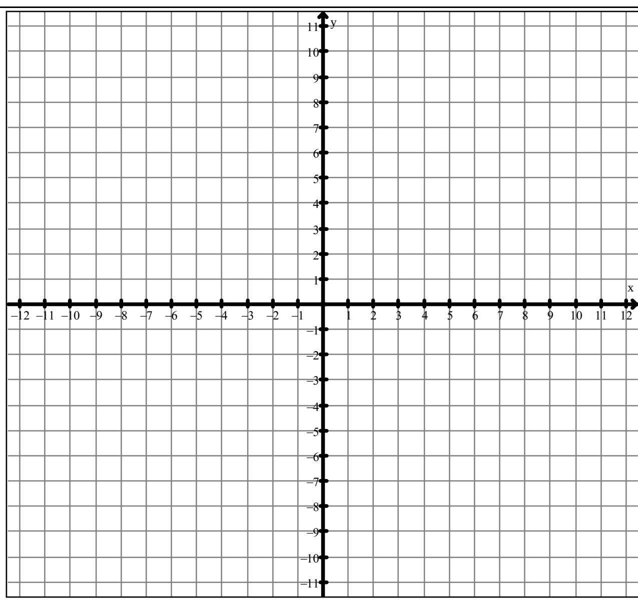


3. A (-2, -2) B (2, 10)

$$Slope = \frac{Rise}{Run}$$

y-intercept =

Equation:



4. A (4, -6) B (12, 0)

$$Slope = \frac{Rise}{Run}$$

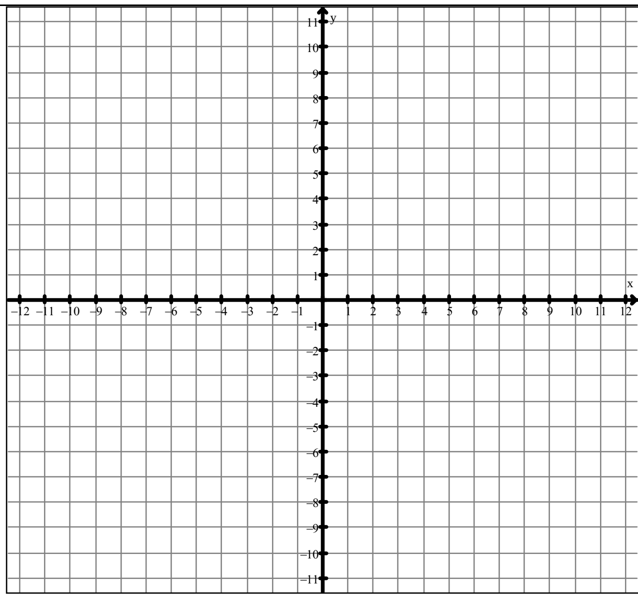
y-intercept =

Equation:

3.8.4 Writing Equations of Lines (Continued)

For each of the following questions:

1. Plot the points on the given grid.
2. Draw a line connecting the points and extend the line in both directions to the edge of the graph.
3. Calculate the slope (rate of change) using the formula. Compare your answer with your graph.
4. Using the graph state the y-intercept.
5. Write the equation of the line in slope y-intercept form.
6. Verify your equation using a graphing calculator.

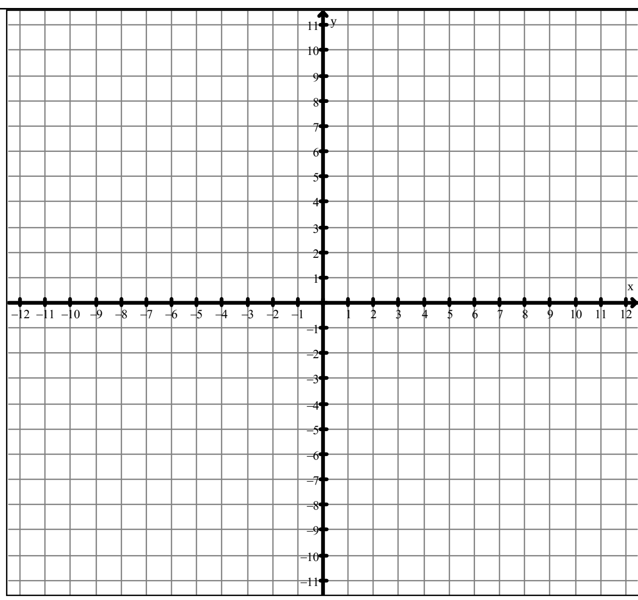


5. A (-6, 4) B (5, 4)

$$Slope = \frac{Rise}{Run}$$

y-intercept =

Equation:



6. A (-6, 1) B (12, 4)

$$Slope = \frac{Rise}{Run}$$

y-intercept =

Equation:

3.9.2 Yes, We got no Graph Paper!

Given points, the slope and/or the y-intercept, write the equation in *y=mx+b* form for each of the following:

A coaches B	**B coaches A**
Given: slope = 5, y-intercept = 5	**Given**: M = -2, b = 3
Equation:	**Equation:**
Given: Slope parallel to y = 2x – 7 with the same y-intercept as y = 4x – 10	**Given**: Slope parallel to x = 5 going through point A (2, 5)
Equation:	**Equation:**
Given: Slope is 0, y-intercept = 5	**Given**: slope = 4, Point A (0, 3)
Work Shown:	**Work Shown:**
Equation:	**Equation:**
Given: Point A (4, 3), Point B (-1, 3)	**Given**: Point A (0, -1), Point B (4, 8)
Work Shown:	**Work Shown:**
Equation:	**Equation:**
Given: Slope = $\frac{3}{5}$, Point (5, 7)	**Given**: M = $\frac{-5}{3}$, Point A (5, 0)
Work Shown:	**Work Shown:**
Equation:	**Equation:**

3.9.2 Yes, We got no Graph paper! (Continued)

Given two points, the slope and/or the y-intercept, write the equation in *y=mx+b* form for each of the following:

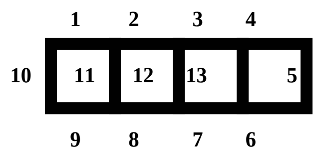
A coaches B	B coaches A
Given: Point A (10, 19), Point B (18, 31)	**Given:** Point A (4, 6), Point B (7, 15)
Work Shown:	**Work Shown:**
Equation:	**Equation:**
Given: Point A (5, 0), Point B (0, 200)	**Given:** Point A (0, 5), Point B (200, 0)
Work Shown:	**Work Shown:**
Equation:	**Equation:**
Given: Point A (1.5, 6.5), Point B (-1.5, -2.5)	**Given:** Point A (1, 8.50), Point B (4, 28.50)
Work Shown:	**Work Shown:**
Equation:	**Equation:**

3.9.3: I'm on your side.

You will be assigned one of four shapes. Your job is to find the equation relating the number of shapes and the number of sides and then answer some other questions.

SQUARE INVESTIGATION

Start by placing squares side by side as shown. **Note**: This arrangement of 4 squares has 13 sides.



1. Complete the following table relating the number of squares and total number of sides.

Number of squares (n)	Number of sides (s)
1	
2	
3	
4	13
5	
6	
7	

Equation: s = ____ n + ______

(Remember: You need the slope and y-intercept. Use your knowledge to calculate these values.)

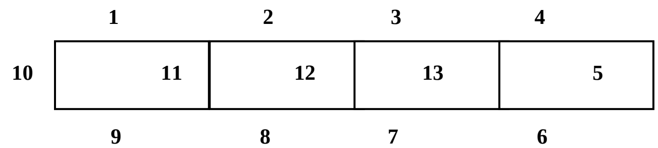
2. Use your equation to calculate the number of sides that 50 squares placed side by side would have.

3. Use your equation to calculate how many squares you would have if you counted all the sides and got a number of sides equal to 256?

3.9.3: I'm on your side. (Continued)

RECTANGLE INVESTIGATION

Start by placing rectangles side by side as shown. **Note**: This arrangement of 4 rectangles has 13 sides.



1. Complete the following table relating the number of rectangles and total number of sides.:

Number of rectangles (n)	Number of sides (s)
1	
2	
3	
4	13
5	
6	
7	

Equation: s = ____ n + ______

(Remember: You need the slope and y-intercept. Use your knowledge to calculate these values.)

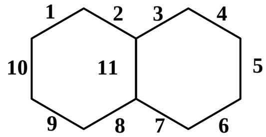
2. Use your equation to calculate the number of sides that 75 rectangles placed side by side would have.

3. Use your equation to calculate how many rectangles you would have if you counted all the sides and got a number of sides equal to 724?

3.9.3: I'm on your side. (Continued)

HEXAGON INVESTIGATION

Start by placing hexagons side by side as shown. **Note**: This arrangement of 2 hexagons has 11 sides.



1. Complete the following table relating the number of hexagons and total number of sides.

Number of hexagons (n)	Number of sides (s)
1	
2	11
3	
4	
5	
6	
7	

Equation: s = ____ n + ______

(Remember: You need the slope and y-intercept. Use your knowledge to calculate these values.)

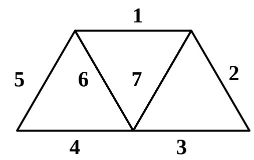
2. Use your equation to calculate the number of sides that 76 hexagons placed side by side would have.

3. Use your equation to calculate how many hexagons you would have if you counted all the sides and got a number of sides equal to 1206?

3.9.3: I'm on your side. (Continued)

TRIANGLE INVESTIGATION

Start by placing triangles side by side as shown. **Note**: This arrangement of 3 triangles has 11 sides.



1. Complete the following table relating the number of triangles and total number of sides.

Number of triangles (n)	Number of sides (s)
1	
2	
3	7
4	
5	
6	
7	

Equation: s = ____ n + ______

(Remember: You need the slope and y-intercept. Use your knowledge to calculate these values.)

2. Use your equation to calculate the number of sides that 76 triangles placed side by side would have.

3. Use your equation to calculate how many triangles you would have if you counted all the sides and got a number of sides equal to 483?

3.9.4: I'm on your side - Journal

Your best friend has called you for help on writing equations of lines. They have been given two points. Explain to them two different ways to write the equation of the line. You may use words, numbers or graphs in your explanation.

3.10.1: So, You Think You Know Everything About Lines? Review of Concepts

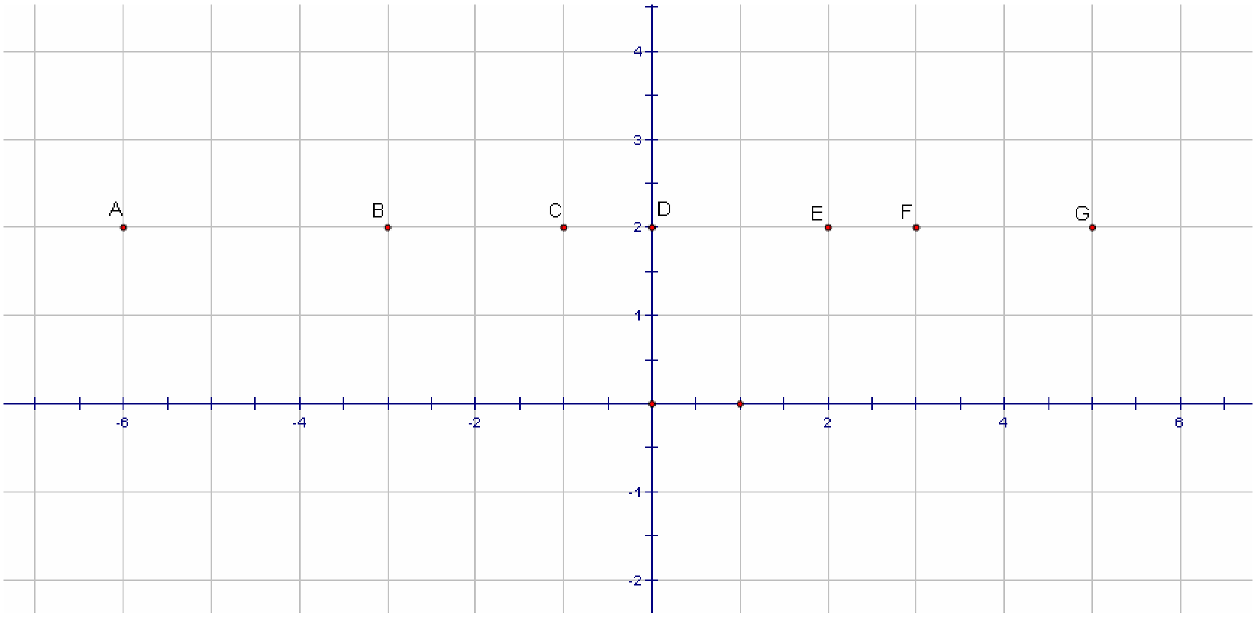
You've learned a lot up to this point in the unit, and to ensure that you still remember it, let's do a little review. With your partner complete the following questions. Feel free to consult your notebook if you cannot remember.

1. What is a y-intercept? What is an x-intercept?	Give an example of each (in coordinate form).
2. Give an example of an equation in Standard Form.	How does the Standard Form make graphing easier for you?
3. If you graph the line using the Standard Form, how many intercepts do you have?	Can you graph a line any other way so that it will only have 1 intercept? (If so, sketch an example below.)
4. Is it possible to graph a line so that it will have no intercepts? Explain.	Is it possible to have more than 2 intercepts? Explain.

3.10.2: So, You Think You Know Everything About Lines? Horizontal Lines Investigation

With your partner complete the investigation below. You will be asked to coach someone later.

1. For the graph below, write the coordinates of each point on the graph in the table below.



A (_______ , ________) B (_______ , ________)

C (_______ , ________) D (_______ , ________)

E (_______ , ________) F (_______ , ________)

G (_______ , ________)

2. What do all the points have in common?

3. There is only one point that has a coordinate of zero. What is another name for this point?

3.10.2: So, You Think You Know Everything About Lines? Horizontal Lines Investigation (Continued)

4. What is the equation of the line joining all the points? (**Hint**: The slope of the line is zero so the equation only depends on the value of the y intercept.)

5. What if all the points from the graph in question 1 shift up 2 units. What will your equation be now?

6. What if all the points from the graph in question 1 shift down 4 units. What will your equation be now?

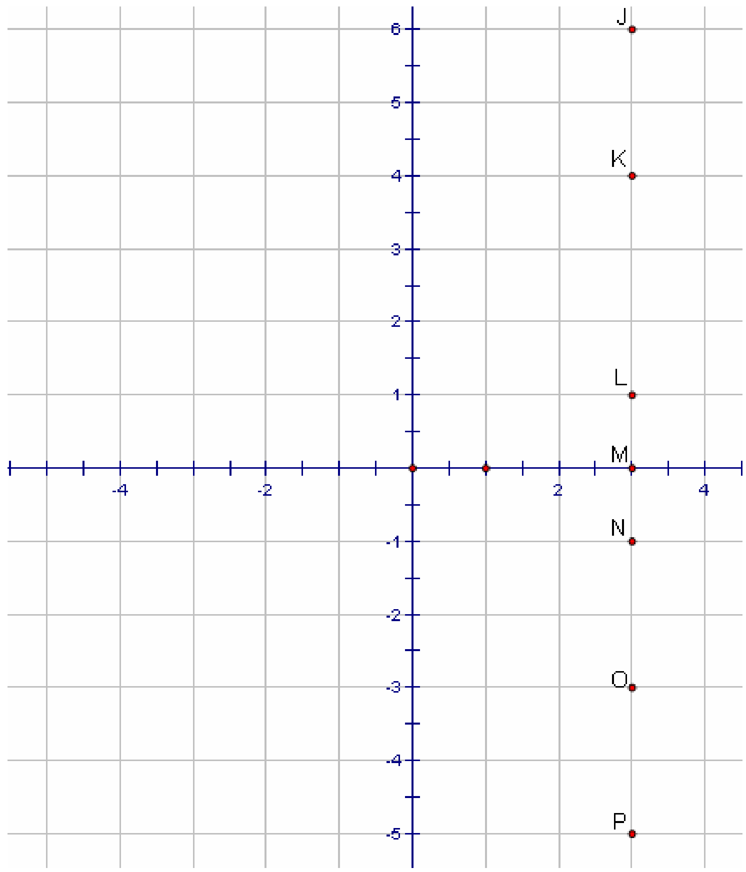
7. Write the equation of the horizontal line that passes through:
   a) (3,4) b) (-2,-4) c) (2.0)

8. Write a general equation for all horizontal lines? (**Hint**: Use **b** for the y-intercept)

3.10.3: So, You Think You Know Everything About Lines? Vertical Lines Investigation

With your partner complete the investigation below. You will be asked to coach someone later.

1. For the graph below, write the coordinates of each point on the graph in the table below.



J (________ , _________) K (________ , _________)

L (________ , _________) M (________ , _________)

N (________ , _________) O (________ , _________)

P (________ , _________)

2. What do all the points have in common?

3. There is only one point that has a coordinate of zero. Is there another name for this point?

3.10.3: So, You Think You Know Everything About Lines? Vertical Lines Investigation (Continued)

4. What is the equation of the line joining all the points? (**Hint**: The slope of the line is undefined so the equation only depends on the value of the x intercept.)

5. What if all the points from the graph in question 1 shift right 2 units. What will your equation be now?

6. What if all the points from the graph in question 1 shift left 4 units. What will your equation be now?

7. Write the equation of the vertical line that passes through:
   a) (3,4)　　b) (-2,-4)　　c) (0.-1)

8. Write a general equation for all vertical lines? (**Hint**: Use **a** for the x-intercept)

3.10.6 Converting from Standard to Slope Y-Intercept Form – Practice

1. Convert the equations below into slope y-intercept form.

a) $3x + y - 1 = 0$

b) $3x - 4y - 12 = 0$

2. Now, state the slope and y-intercept for each equation.

a)

m = ________ b = _________

b)

m = ________ b = _________

3. For each equation:
   - Convert to slope y-intercept form
   - State the slope and y-intercept.
   - Graph on the grid provided. Use a different colour for each line. Label each.

a) $2x + y - 4 = 0$

m = ___ b = ___

b) $4x + 2y + 6 = 0$

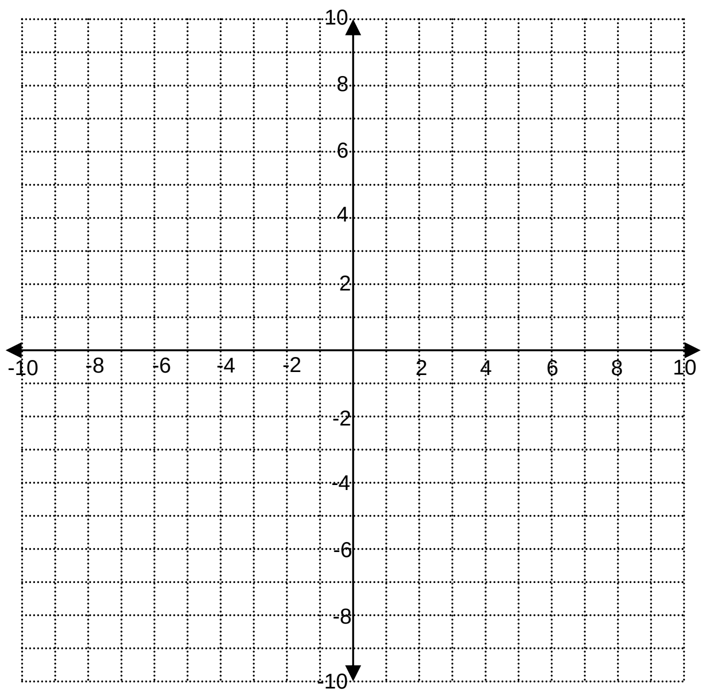
m = ___ b = ___

c) $x - y - 5 = 0$

m = ___ b = ___

d) $3x + 2y - 8 = 0$

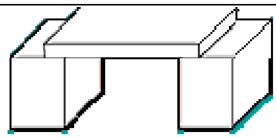
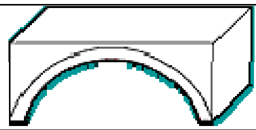
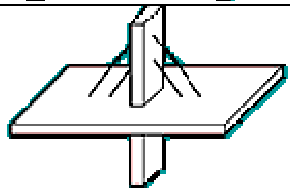
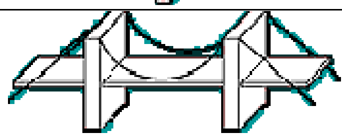
m = ___ b = ___



3.11.2 London Bridge Is Falling Down…Introduction

Introduction to Bridge Building

There are many different types of bridge designs which serve different purposes. The factors that determine the bridge design includes the type of traffic (i.e. more trucks or cars), what is under the bridge, the aesthetics and the cost.

	**Beam or Plank Bridge**
	**Arch Bridge**
	**Cable-Stayed Bridge**
	**Suspension Bridge**

Source: Images are taken from: NOVA Online http://www.pbs.org/wgbh/nova/bridge/build.html

Before a bridge is constructed, engineers design models to ensure that the bridge can withstand the stress of the load from cars and people.

In today's activity, you will be working in groups of three. Your group will construct two bridge designs out of paper: the Plank Bridge and the Arch Bridge. Using linking cubes, you will record the number of cubes needed to make each bridge collapse at various paper thicknesses.

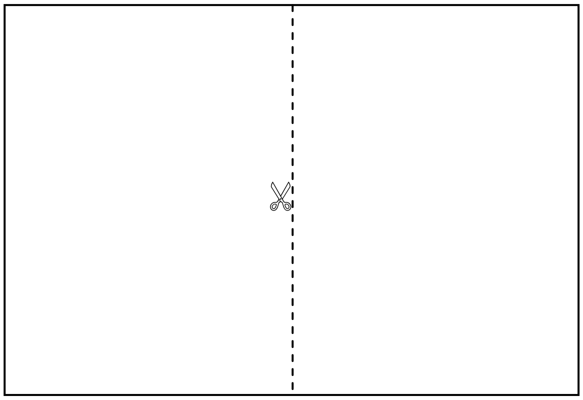
Group Member Responsibilities

Name	Minds On Card	Appointed Job
	y = mx + b	***Data Recorder*** Records information from the activity
	Slope and Y-intercept	***Materials Manager*** Collects all the materials needed Prepares paper and books
	Standard Form	***Model Designer*** Creates each bridge model and adds the load to the bridge model

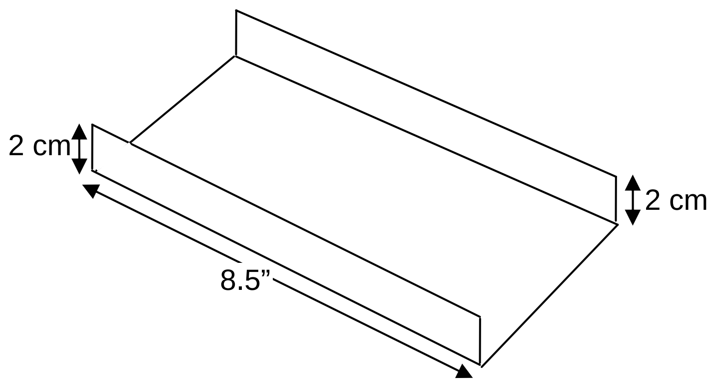
3.11.3 London Bridge Is Falling Down… Instructions

Preparation Instructions

1. Have the materials manager collect 30 linking cubes, a piece of masking tape, a plastic cup and 6 pieces of paper. (Your teacher may have already cut the paper for you by cutting a standard sheet of 8.5” x 11” in half as shown below).



2. Fold **5** pieces of paper as shown below. These will be call you bridge planks.



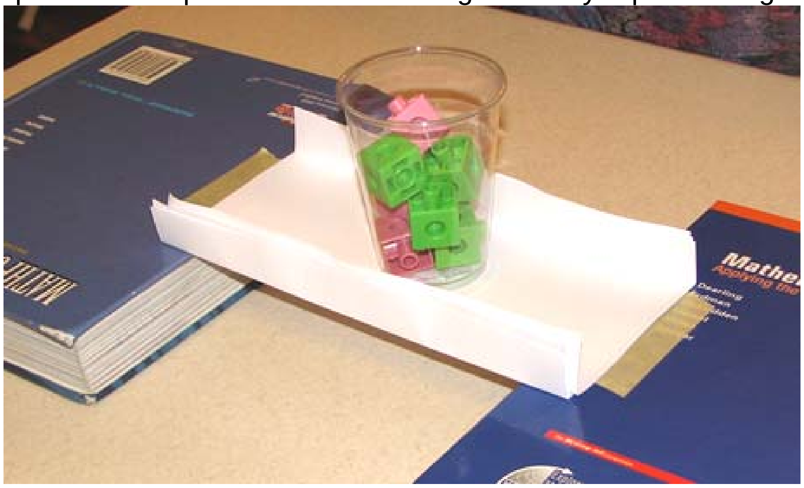
3. Place a piece of masking take 2 cm from the edge of two textbooks. Make sure the spines of each book are facing outside as shown below.

3.11.3 London Bridge Is Falling Down…Instructions (Continued)

Beam Bridge Instructions

4. Place the first bridge plank such that the ends of each plank touch the masking tape as shown below.

5. Next, place the plastic cup in the middle of the Beam Bridge.
6. Place a linking cube into the cup gently. Continue placing **one** linking cube at a time until the bridge collapses. The bridge must touch the desk for it to be considered a collapse.
7. Record this data on the data collection sheet provided.
8. Place another plank over top the first one creating a two layer plank bridge.



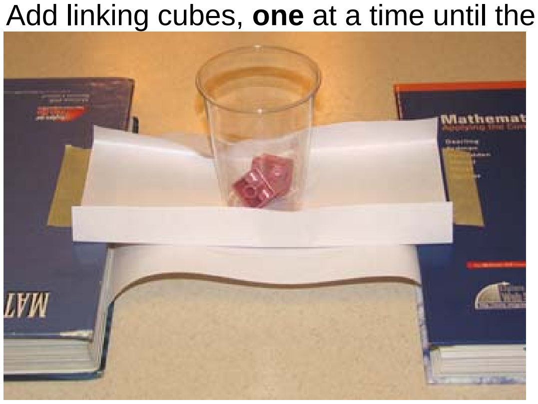
9. Place the empty cup in the middle of the bridge.
10. Repeat step 6 – 7
11. Repeat steps 8 – 10 for a 3, 4, and 5 layer plank beam bridge.

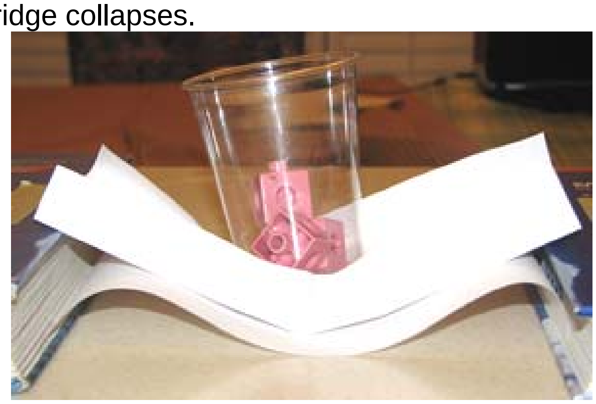
3.11.3 London Bridge Is Falling Down…Instructions **(Continued)**

Arch Bridge Instructions

1. The next design is to create an arch bridge. Using the same textbooks and setup as the last bridge, place the unfolded piece of paper between the textbooks to form an arch as shown below.

2. Place one of the planks from the last activity on top of the arch making sure the ends of the plank coincide with the tape.
3. Place the empty cup in the middle of the plank.
4. Add linking cubes, **one** at a time until the bridge collapses.





5. Record this data on the data collection sheet provided.
6. Place another plank over top the first one creating a two layer plank bridge.
7. Place the empty cup in the middle of the bridge.
8. Repeat step 4 – 5
9. Repeat steps 6 – 8 for a 3, 4, and 5 layer plank arch bridge.

3.11.3 London Bridge Is Falling Down…Instructions (Continued)

London Bridge Is Falling Analysis

Data Tables

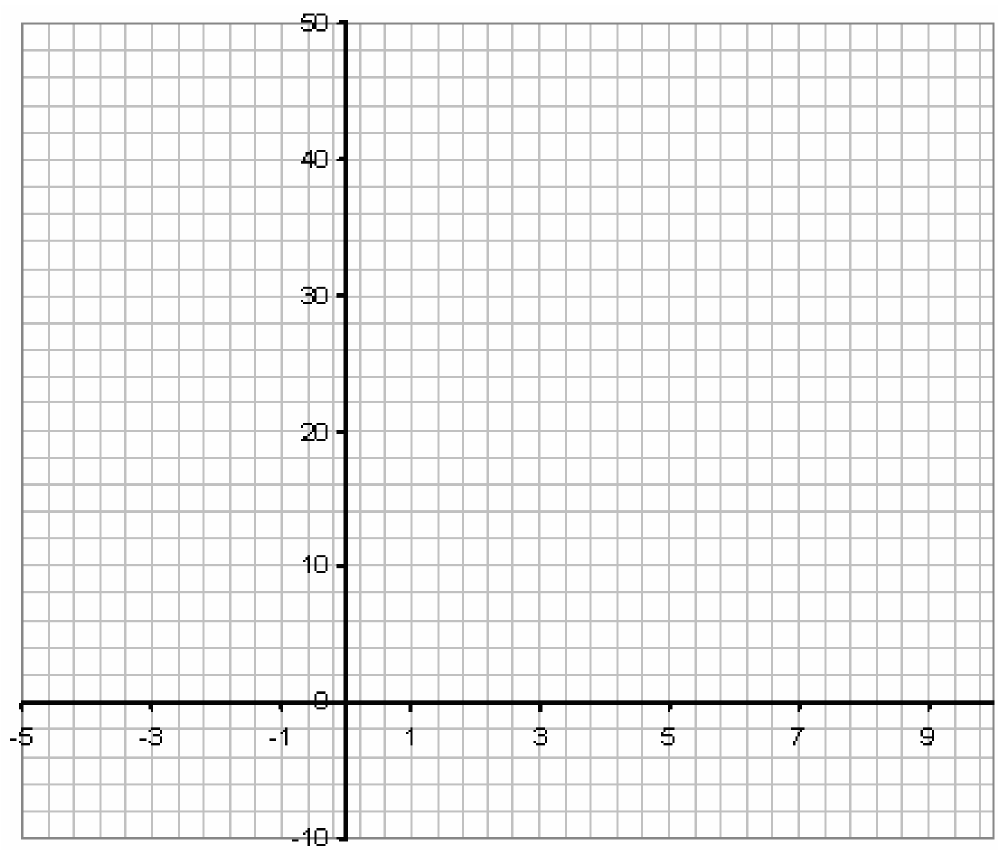
1. Place the data from your investigation on the tables below

BEAM BRIDGE	
Number of Planks	**Number of Cubes**

ARCH BRIDGE	
Number of Planks	**Number of Cubes**

Graphs:

2. Use this grid for the questions below.



3.11.3 London Bridge Is Falling Down…Instructions (Continued)

Calculations:

3. What variable is the x-variable (independent) (Circle one): **Number of Plank**s or **Number of Cubes**
4. What variable is the y-variable (dependent) (Circle one): **Number of Plank**s or **Number of Cubes**
5. Create a scatter plot from the data of both bridges using a different colour for each data set. Label axes with appropriately.
6. Create lines of best fit for both sets of data using a different colour for each line.
7. From the Beam Bridge line of best fit, choose two points. Calculate the slope using these two points.

   m = __________________

8. Explain the significance of the slope in the context of this activity.
9. Using the slope and coordinates of one of the two points calculate the y-intercept by substituting into **y=mx+b** and solving for **b**.

   b = __________________

10. Write the equation of the Beam Bridge.

3.11.3 London Bridge Is Falling Down…Instructions (Continued)

11. From the Arch Bridge line of best fit, choose two points. Calculate the slope from these two points.

    m = ________________

12. Explain the significance of the slope in the context of this activity.

13. Using the slope and coordinates of one of the two points calculate the y-intercept by substituting into **y=mx+b** and solving for **b**.

    b = ________________

3.11.3 London Bridge Is Falling Down…Instructions (Continued)

14. Write the equation of the Arch Bridge.

15. You want to be sure that a bridge can hold 100 cars at one time. If each car is represented by a linking cube, how many planks would your bridge need? Show work below.

Beam Bridge	Arch Bridge

16. You recently saw two bridges hold 250 “cars” at once. How many planks would be required to hold those cars for both bridges? Show work below.

Beam Bridge	Arch Bridge

3.11.3 London Bridge Is Falling Down…Instructions (Continued)

Reflection:

17. What are the x-intercepts of both graphs? Interpret their significance in the context of this activity.

18. Which bridge presents a better design? Offer mathematical proof using data you collected and calculations you did.

19. One of your friends says the she constructed an amazing bridge but the plans were lost. The only thing left was the equation:

$$5x - 3y + 15 = 0$$

   a. Graph this equation on the grid with your other two graphs
   b. Using the graph, does this equation ever cross one of the other lines? What do these points mean in the context of this problem?
   c. Based on the graph and the equation, is your friends bridge better, worse or the same as the Beam bridge? Offer mathematical proof.
   d. Based on the graph and the equation, is your friends bridge better, worse or the same as the Arch bridge? Explain using mathematics.

Unit 3 Equations of Lines Review

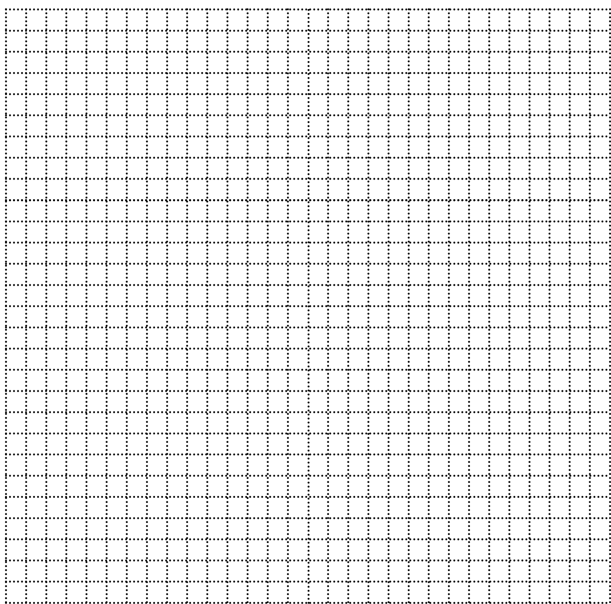
1. On a Cartesian coordinate system, plot and label the following points.

   A = (2,-1) B = (4, 10) C = (1, 7) D = (2,-3)

   a) Draw the following lines: AB AC BC CD

   b) Calculate the slope for each line using a rate triangle:

   Slope (AB) = Slope (AC) =



   c) Calculate the following slopes algebraically. Verify with the graph.

   Slope (BC)= Slope (CD)=

2. Comparison of Slopes

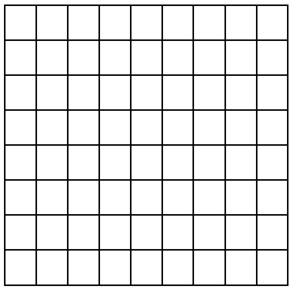
   a) If a line slants upward from left to right, it has a _______________ slope.

   b) If a line slants downward from left to right, it has a _______________ slope.

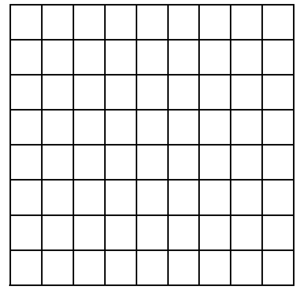
Unit 3 Equations of Lines Review (continued)

3. Draw two examples of lines with a positive slope and two examples of lines with a negative slope in the corresponding grids below.

Lines With Positive Slopes



Lines With Negative Slopes



4. Circle the equations of the lines that are horizontal.
   Underline the equations of lines that are vertical.

a) x=7	b) y=3	c) x=-3
d) y=5	e) y=3x+6	f) y=-2

5. Complete the sentences by filling in the blanks.

Horizontal Lines

a) The equations of all horizontal lines are of the form ___________.

b) The slope of a horizontal line is _________________.

c) Horizontal lines do not cross the ___ axis.

Vertical Lines

a) The equations of all vertical lines are of the form _____________.

b) The slope of a vertical line is ____________________.

c) Vertical lines do not cross the ___ axis

Unit 3 Equations of Lines Review (continued)

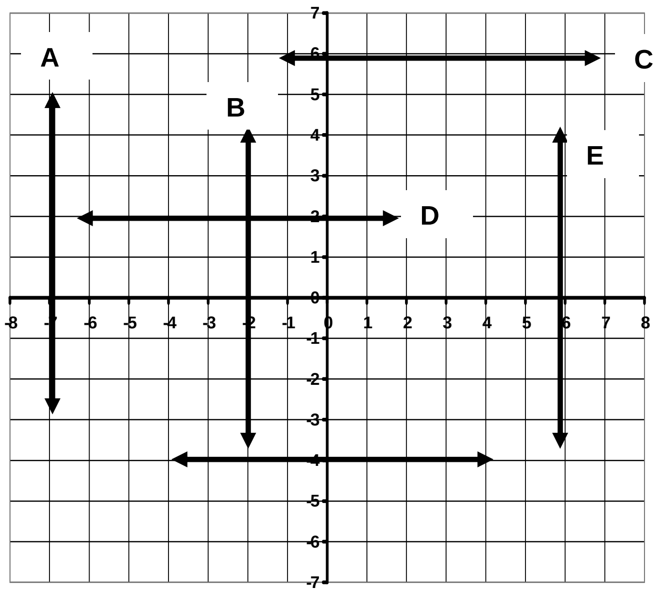
6. Write the equation of each line.

A: ______________________

C: ______________________

E: ______________________

F: ______________________



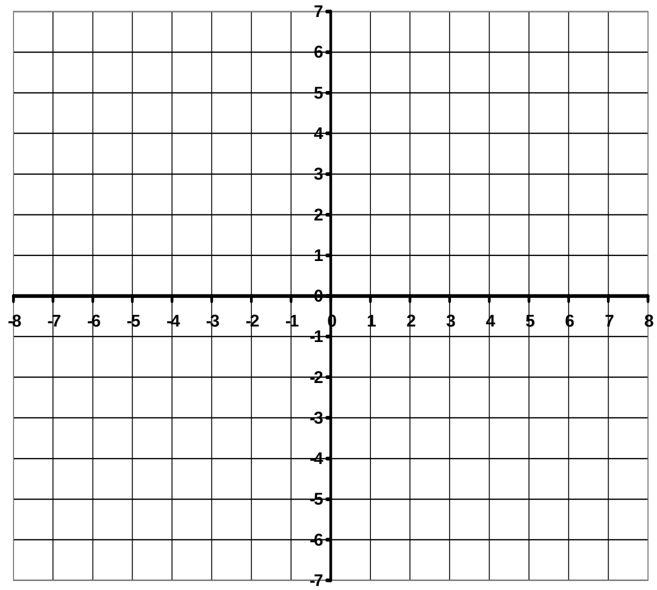
7. Graph and label the lines.

A: x = 3

B: y = -6

C: y = 5

D: x = -6



8. a) When the equation of a line has the form *y=mx+b*,

m is the __________ of the line and

b is the _______________.

b) State the slope and coordinates of the y-intercept for each.

i) $y = \frac{2}{5}x - 4$ ii) y = -3x   iii) y = -2x + 5   iv) y = -3

9. Write the equation of each line given:

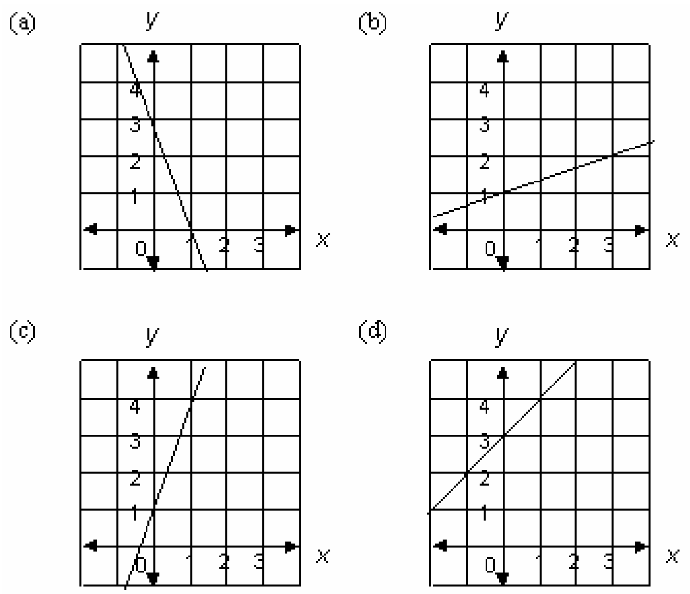
a) slope 5 and y-intercept 3

b) b= 7 m = -½

c) slope of -2 and passing through A(0, 4)

d) slope parallel to y = 3x + 7 with same y-intercept as y = 8x –19

10. Find the equation of each line.



(a) ________________

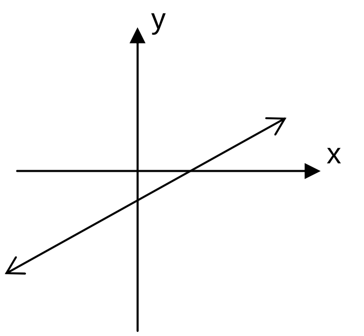
(b) ________________

(c) ________________

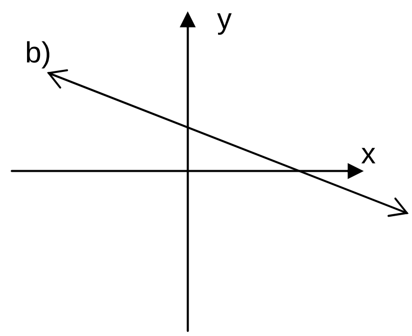
(d) ________________

11. State two possible equations for each line.

a)



b)



1)____________________________ 1)____________________________

2)____________________________ 2)____________________________

c) Justify your choices for m and b:

Unit 3 Equations of Lines Review (continued)

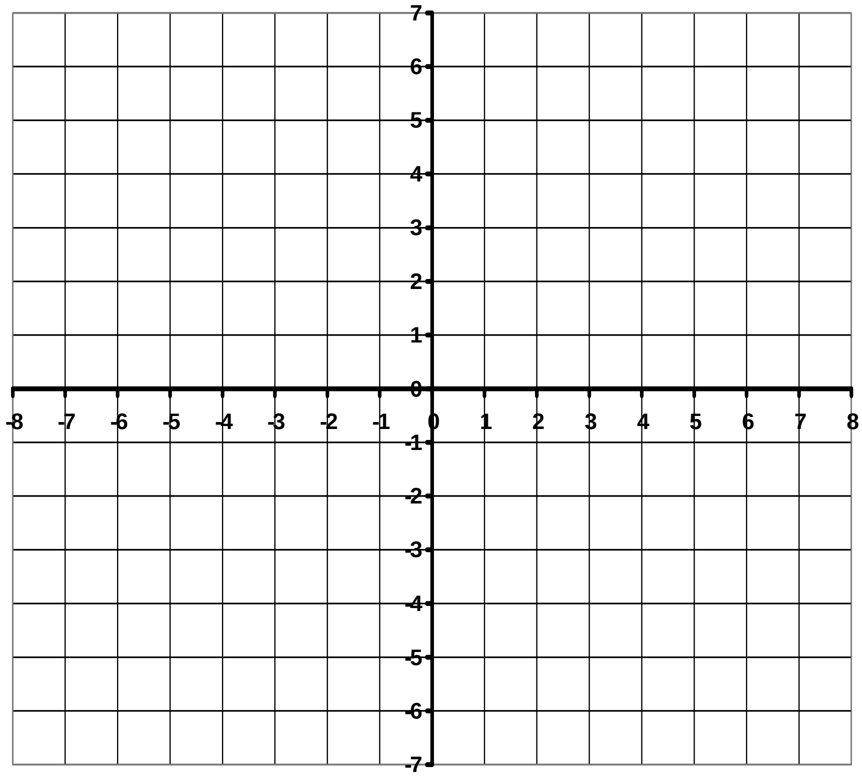
12. Draw rough sketches of the following lines showing the y-intercept and slope triangle for each.

a) $y = \frac{2}{3}x + 1$

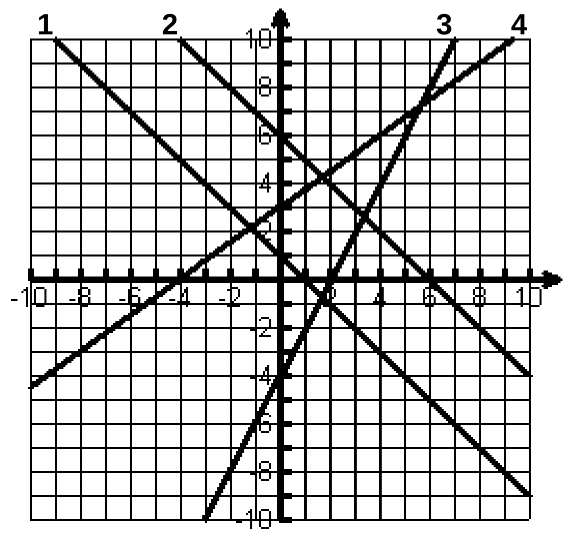
b) $y = \frac{1}{5}x - 2$

c) $y = -3x + 2$

d) $y = -\frac{7}{5}x - 3$



Answer the following questions based on the lines graphed below.



13. Which lines will have positive slopes?

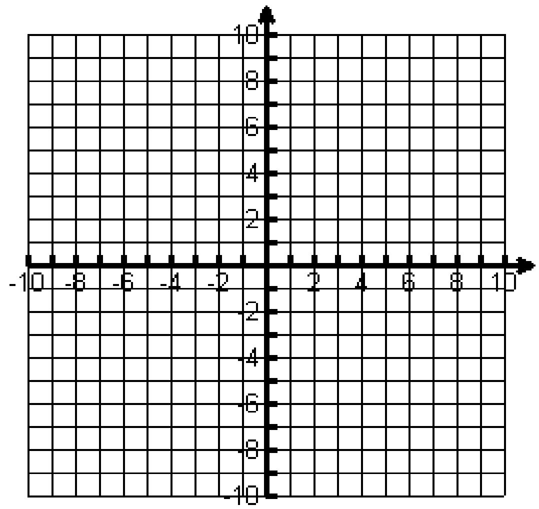
14. Which lines will have negative slopes?

15. Fill in the table by listing the coordinates for the x-intercepts and y-intercepts.

Line	x-intercepts	y-intercepts
1		
2		(0, 6)
3		
4	(-4, 0)	

Unit 3 Equations of Lines Review (continued)

16. How does knowing the x-intercept and y-intercept help you to graph a line?



17. Graph the following lines by finding the *x* and *y*-intercepts.

a) $3x - 2y - 6 = 0$ b) $2x - 5y - 14 = 0$

18. Find the equation of the line given the point and slope.

a) (2, 1); m = 3

b) (-3, 4); m = ¾

c) (4,-5); m = -1

d) (5, 0); m = -6

19. Find the equation of the line joining the two given points.

a) (2, 1); (-3, 4);

c) (4,-5); (5, 0);

Unit 3 Equations of Lines Review (continued)

Scenario	**1.*Babysitting Earnings*** A family pays the babysitter $4.00/hr, plus a tip of $5.00.	**2. *Bank Account Balance*** A bank account is opened with a balance of $900. Each week $150 is withdrawn from the account.	**3. *Car Rental Costs*** Rent-A-Ride charges a flat fee of $55 plus $0.25/km to rent a car.
Introduce Variables	Let x = Let y =	Let x = Let y =	Let x = Let y =
Equation in the form of y=mx+b			
In real-life terms, what is the y-intercept?			
What would be the real-life implication of a greater y-intercept?			
What would be the real-life implication of a smaller y-intercept?			
In real-life terms, what is the rate of change (m)?			
What would be the real-life implication of a greater (steeper) rate of change?			
What would be the real-life implication of a smaller (flatter) rate of change?			

3.W: Definition Page

Term	Picture / Sketch / Examples	Definition
Dependent Variable		
Independent Variable		
Initial Value		
Rate of Change		
Rise		
Run		
Direct Variation		
Partial Variation		
First Differences		
Slope		

3.W: Definition Page (Continued)

Term	Picture / Sketch / Examples	Definition
X-intercept		
Y-intercept		
Algebraic Model		
Vertical Line		
Horizontal Line		
Standard Form of a Line		
Slope Y-intercept Form of a Line		

3.S: Unit Summary Page

Unit Name: ____

Using a graphic organizer of your choice create a unit summary.

3.R: Reflecting on My Learning (3, 2, 1)

3 Things I know well from this unit
2 Things I need explained more
1 Question I still have

3.RLS: Reflecting on Learning Skills

Students should be aware of the importance that these skills have on your performance. After receiving your marked assessment, answer the following questions. Be honest with yourself. Good Learning Skills will help you now, in other courses and in the future.

- E – Always
- G – Sometimes
- S – Need Improvement
- N – Never

Organization
- E G S N I came prepared for class with all materials
- E G S N My work is submitted on time
- E G S N I keep my notebook organized.

Work Habits
- E G S N I attempt all of my homework
- E G S N I use my class time efficiently
- E G S N I limit my talking to the math topic on hand
- E G S N I am on time
- E G S N If I am away, I ask someone what I missed,
- E G S N I complete the work from the day that I missed.

Team Work
- E G S N I am an active participant in pairs/group work
- E G S N I co-operate with others within my group
- E G S N I respect the opinions of others

Initiative
- E G S N I participate in class discussion/lessons
- E G S N When I have difficulty I seek extra help
- E G S N After I resolve my difficulties, I reattempt the problem
- E G S N I review the daily lesson/ideas/concepts

Works Independently
- E G S N I attempt the work on my own
- E G S N I try before seeking help
- E G S N If I have difficulties I ask others but I stay on task
- E G S N I am committed to tasks at hand

Yes No I know all the different ways available in my school, where I can seek extra help.

Yes No I tried my best.

What will I do differently in the next unit to improve?

____
____
____
____

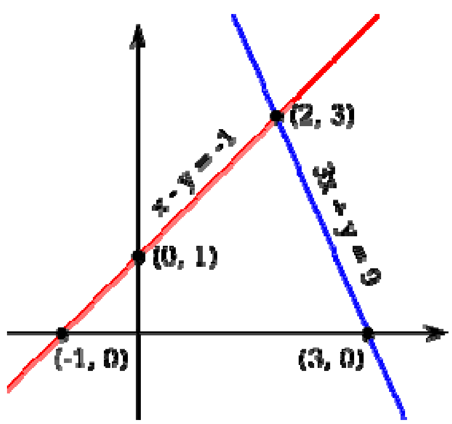
TIPS4RM

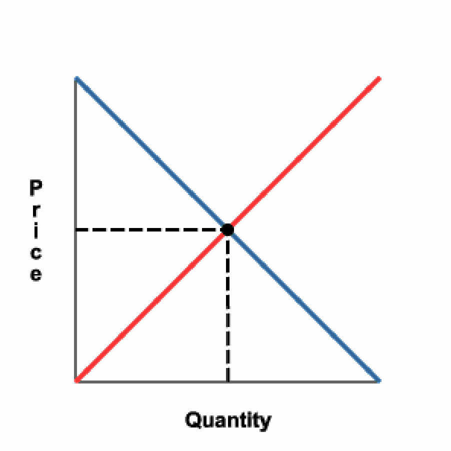
Targeted Implementation and Planning Supports for Revised Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Course: Grade 10 Applied Mathematics (MFM2P)

Unit 4: Linear Systems





Dufferin-Peel Catholic District School Board

Student

REVISED

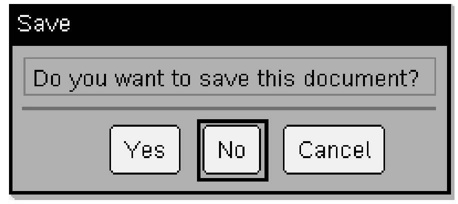
August 2008

Unit 4- Linear Systems

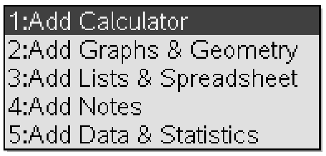
Nspire CAS Handheld Manual

Getting Started

When you turn on the handheld, press ctrl N.



You will be asked whether you want to save the document. Select **No**. To do this, use the large circular "navpad" to move to the right, then press the button in the middle of the navpad.



Next select **1:Add Calculator**. To do this, press the button again.

You are now ready to use CAS on the handheld.

Some Helpful Shortcuts

If you make a mistake at any point that you want to undo, press ctrl Z.

If you undo something that you want back again, press ctrl Y.

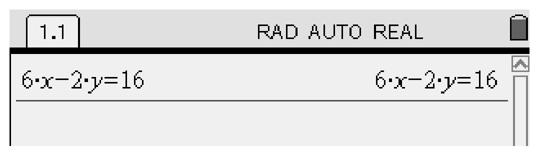
How to Solve for a Variable: Example One

Say that you wish to solve the equation 6x – 2y = 16 for the variable y.

To do this, first be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section above.

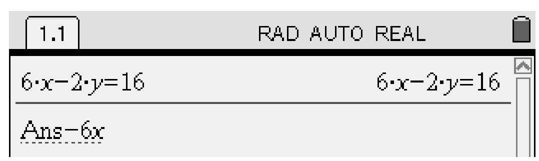
First type in the equation that you want to solve. Use the number pad and the green letter keys; the operations (÷, ×, -, +) are located on the right, and the equals sign (=) is in the top-left corner of the keypad. When you have typed in the equation, press the enter key, found in the bottom-right corner.

The top of your screen will look something like this:

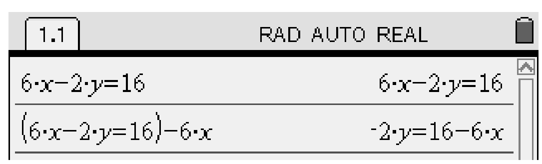


Now decide how you would start in solving for y.

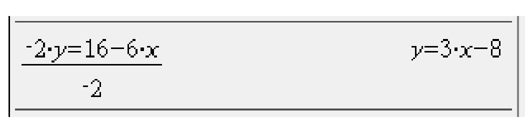
Perhaps you've decided that subtracting 6x from both sides of the equation is a good start. Wonderful! To do this, immediately press − 6 X. Notice that the handheld automatically inserts Ans . What is this?



Ans stands for the last answer you found. If you now press the enter key, the handheld will subtract 6x from the left side and the right side of 6x - 2y = 16. You will see this result:



Continue solving the equation. You probably see that to finally isolate the y variable, it is necessary to divide the equation by -2 on both sides. Again, just start typing the operation you want to perform. Press ÷ (−) 2. The handheld will insert Ans for you. Press enter to calculate the result.



As you can see, the handheld reports that y = 3x - 8 .

Nspire CAS Handheld Manual (Continued)

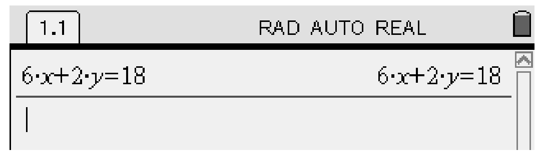
How to Solve for a Variable: Example Two

Say that you wish to solve the equation 6x + 2y = 18 for the variable y.

To do this, first be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section above.

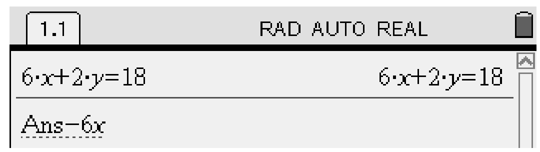
First type in the equation that you want to solve. Use the number pad and the green letter keys; the operations (÷, ×, -, +) are located on the right, and the equals sign (=) is in the top-left corner of the keypad. When you have typed in the equation, press the key, found in the bottom-right corner.

The top of your screen will look something like this:

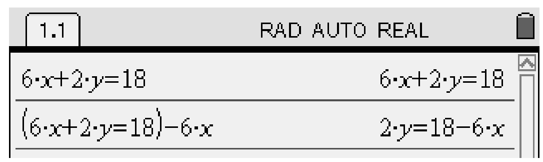


Now decide how you would start solving for y.

Perhaps you've decided that subtracting 6x from both sides of the equation is a good start. Wonderful! To do this, immediately press . Notice that the handheld automatically inserts Ans . What is this?

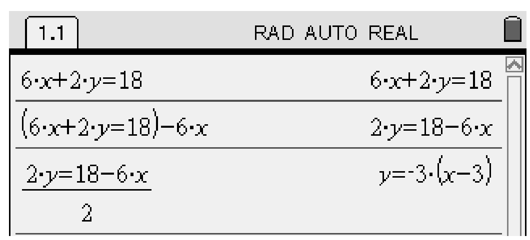


Ans stands for the last answer you found. If you now press the key, the handheld will subtract 6x from the left side and the right side of 6x + 2y = 18. You will see this result:



Continue solving the equation. You probably see that to finally isolate the y variable, it is necessary to divide the equation by 2 on both sides. Again, just start typing the operation you want to perform. Press . The handheld will insert Ans for you. Press to calculate the result.

As you can see, the handheld reports that y = -3(x-3) .



Is this the result you expected?

Your teacher will discuss this with your class.

After the discussion, use the space below to write your own explanation of what this means:

Nspire CAS Handheld Manual (Continued)

How to Check a Solution to a Linear System

Say that you have solved the following linear system:

$4x + 2y = 24$

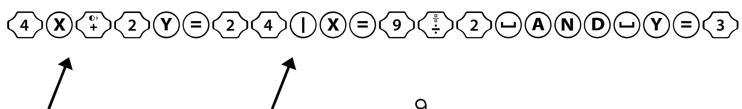
$8x - 6y = 18$

and you believe the solution is $\left(\frac{9}{2}, 3\right)$.

This would be tedious to check by pencil and paper, but it is quick to check with the handheld.

Here is how to do it. First be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section from earlier in this manual.

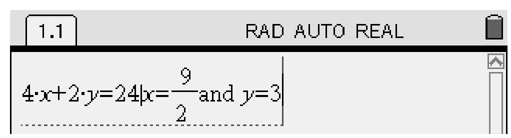
You are going to press the following keys to check the solution against the first equation:



This means: "Check **this** equation **such that** $x = \frac{9}{2}$ and $y = 3$."

Don't forget to press the ␣ key (lower-right corner of keypad) before and after the A N D.

Here is what it will look like on your handheld screen:

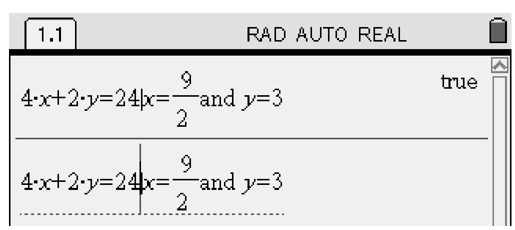


To have the handheld check the solution, press the enter key. If the solution is correct, the handheld will return the result "true". If the solution is not correct, the handheld will report "false".

You should find that the handheld reports that $\left(\frac{9}{2}, 3\right)$ is a correct solution for the first equation.

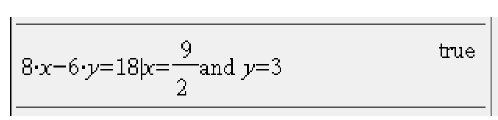
Remember, it is necessary to check the solution in the second equation as well.

It works the same way as before, but you can save some typing! Use the circular "navpad" and press **up** twice. The first command you entered is highlighted. Now press the enter key. The handheld copies the command down to the line you are working on. You can now use the navpad to move **left** until the cursor is behind the | symbol. It looks like this:



Press the clear key to erase the first equation, then type the second equation. Then press enter.

As you can see, $\left(\frac{9}{2}, 3\right)$ is a correct solution for the second equation as well.



Since the solution is correct for **both** equations from the linear system, we know it must be the right answer.

Nspire CAS Handheld Manual (Continued)

How to Add or Subtract Two Equations

The elimination method for solving a linear system involves adding or subtracting the given equations.

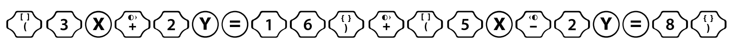
Say that you are considering the following linear system:

```
3x + 2y = 16
5x - 2y = 8
```

You probably agree that if we add these two equations, the y variable will be eliminated.

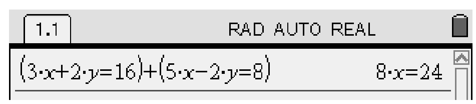
Here is how to do this on a handheld. First be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section from earlier in this manual.

When you type in the equations, be certain to enclose them in brackets. Remember that we decided to add the equations. Here are the keys you should press:



It will look like this on your handheld:

Press the enter key. The handheld will display the result:



You have eliminated the y variable.

Subtracting two equations works the same way as adding two equations. The key is to remember that you must enclose each equation in brackets when you type it into the handheld.

How to Multiply to Find an Equivalent Equation

Consider the following linear system:

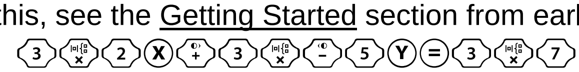
```
2x - 5y = 7
6x + 3y = 3
```

If we immediately add or subtract the equations, neither the x or the y variable is eliminated.

Instead, we must multiply one of the equations by an integer so that the coefficients match. Then, if we subtract the equations, a variable will be eliminated.

Let's multiply the first equation by 3. Remember that all terms on both sides of the equation must be multiplied by 3, so that the equation stays balanced.

Here is how to do this on a handheld. First be certain that you are on a **Calculator** page. If you need help with this, see the Getting Started section from earlier in this manual. Press the following keys:



What you have typed should look like this:

Press the enter key. The handheld will display the result:

Now we have a system that we can begin to solve by subtracting the equations:

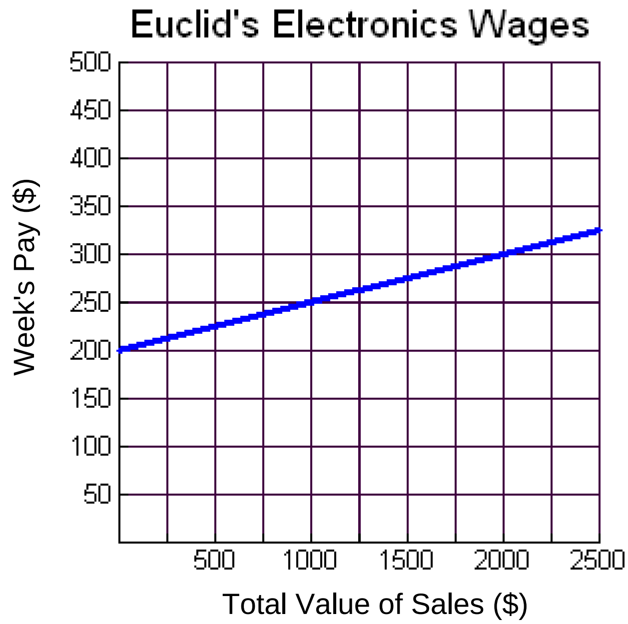
```
6x - 15y = 21
6x + 3y  = 3
```

4.1.1: Working on Commission

Nahid works at Euclid's Electronics. She is paid a salary of \$200 per week plus a commission of 5% of her sales during the week.
The equation $P = 0.05s + 200$, represents Nahid's pay for the week where *P* represents the total pay for the week and *s* represents her total sales.

If Nahid earned **\$290** in a week use the equation to algebraically determine how much she sold.

Use your handheld to help you solve. Refer to the user manual if you need to review how to solve using the handheld.



Nahid is offered another job at Fermat's Footwear, where the pay is a salary of \$100 per week and 10% commission on all sales. The graph below represents the **Pay vs. Sales** for this job.

Which of the following equations do you think represents pay for one week at Fermat's Footwear?

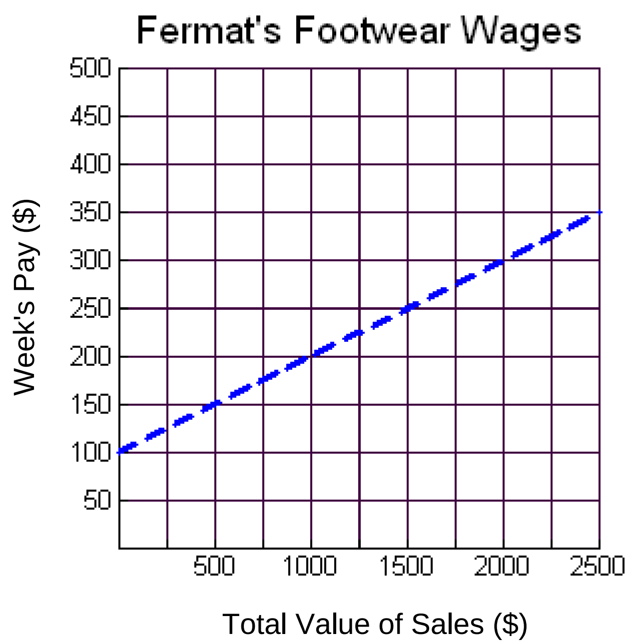
a) $P = 0.01s + 100$

b) $P = 0.10s + 100$

c) $P = 100s + 10$

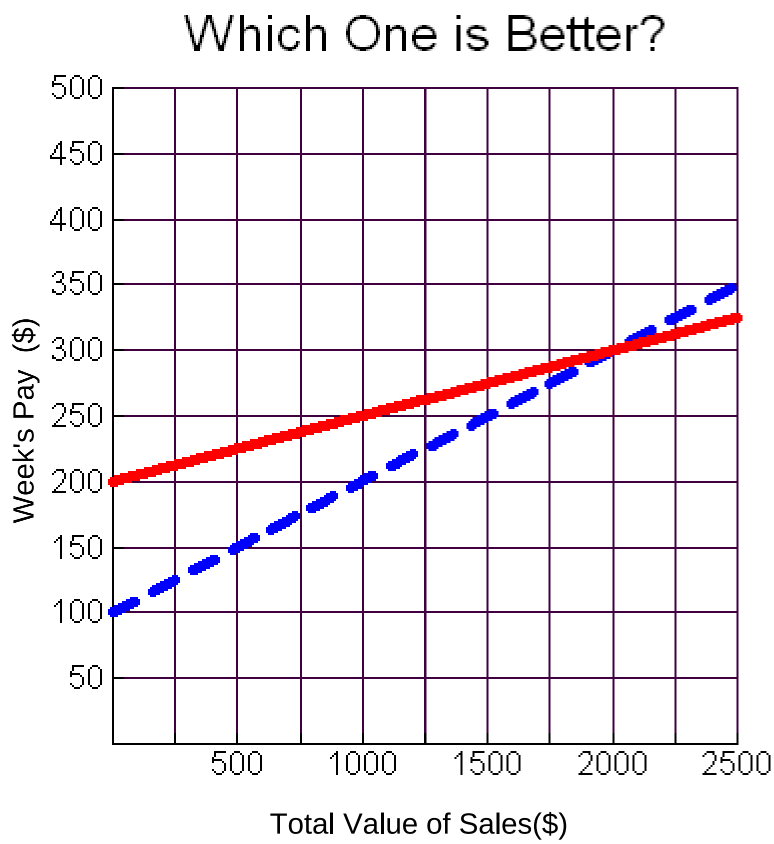
d) $P = 0.05s + 200$

Provide a reason or justify why you selected the equation that you chose. Refer back to the equation for Euclid's Electronics for hints.



4.1.1: Working on Commission (Continued)

Nahid needs help determining which job she should keep. She decides to look at them as a **system of equations** when she creates a graph comparing the two equations at the same time. Analyze the graph and complete the questions below.



______ Euclid's Electronics

……... Fermat's Footwear

1. Where the two lines cross is called the **point on intersection**, or the **solution to the system**. At what coordinates do the two lines cross?

2. What does this coordinate represent in terms of Nahid's sales, and pay for the week?

3. If Nahid usually makes $1500 worth of sales per week, which job should she take? Explain.

4. How does the graph help Nahid determine which is the better job?

5. What does the point (1000, 250) represent in the graph?

4.1.2: What's My Equation?

You are given four problems below. Each problem will require two equations to solve it. The equations that are needed to solve each problem appear at the bottom of the handout. Match the equations with the problems and compare your answers with another student.
Note: There are more equations than problems and all the equations use *x* for the independent variable and *y* for the dependent variable.

Problem A: ***Equations***

Yasser is renting a car. Zeno Car Rental charges $45 for the rental of the car and $0.15 per kilometre driven. Erdos Car Rental charges $35 for the rental of the same car and $0.25 per kilometre driven. Which company should Yasser choose to rent the car from?

Problem B: ***Equations***

The school council is trying to determine where to hold the athletic banquet. The Algebra Ballroom charges an $800 flat fee and $60 per person. The Geometry Hall charges a $1000 flat fee and $55 per person. Which location should the school council select for the athletic banquet?

Problem C: ***Equations***

The yearbook club is considering two different companies to print the yearbook. The Descartes Publishing Company charges a flat fee of $475 plus $4.50 per book. School Memories charges a flat fee of $550 plus $4.25 per book. Which company should the yearbook club select to print this year's yearbook?

Problem D: ***Equations***

The school is putting on the play "Algebra: The Musical". Adult tickets were sold at a cost of $8 and student tickets were sold at a cost of $5. A total of 220 tickets were sold to the premiere and a total of $1460 was collected from ticket sales. How many adult and student tickets were sold to the premiere of the musical?

EQUATIONS:

1. $y = 4.50 + 475x$	2. $60 + 800x = y$	3. $y = 1000 + 55x$	4. $x = 45 + 0.15x$
5. $y = 1000x + 55$	6. $y = 45 + 0.15x$	7. $x + y = 220$	8. $5x + 8y = 220$
9. $y = 4.25x + 550$	10. $y = 550x + 4.25$	11. $y = 800 + 60x$	12. $x + y = 1460$
13. $y = 0.25x + 35$	14. $y = 4.50x + 475$	15. $y = 35x + 0.25$	16. $5x + 8y = 1460$

4.1.2: What's My Equation? (Continued)

Problem A:

Yasser is renting a car. Zeno Car Rental charges $45 for the rental of the car and $0.10 per kilometre driven. Erdos Car Rental charges $35 for the rental of the same car and $0.25 per kilometre driven. Which company should Yasser choose to rent the car from?

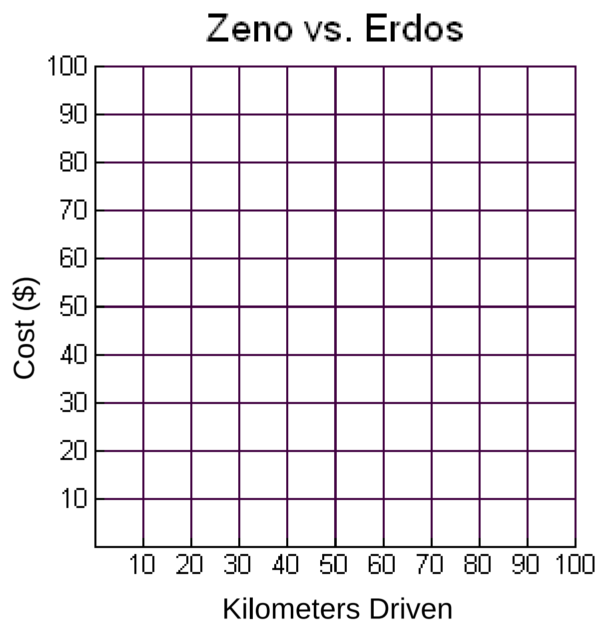
To solve the question, complete the table of values, and the graph.

Zeno

Distance (km)	Cost
0	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	

Erdos

Distance (km)	Cost
0	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	



1. How can the car rental cost and the cost per kilometre be used to draw the graph?

2. What is the point of intersection of the two lines? What does it represent?

3. Under what conditions is it best to rent from Zeno Car Rental?

4. Under what conditions is it best to rent from Erdos Car Rental?

4.1.2: What's My Equation? (Continued)

Problem B:

The school council is trying to determine where to hold the athletic banquet. The Algebra Ballroom charges an $800 flat fee and $60 per person. The Geometry Hall charges a $1000 flat fee and $55 per person.
Which location should the school council select for the athletic banquet?

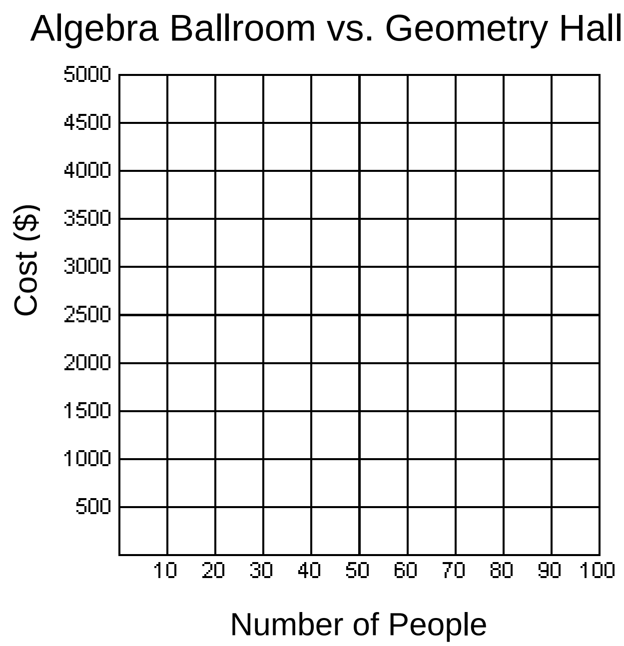
To solve the question, complete the table of values, and the graph.

Algebra Ballroom

Number of People	Cost
0	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	

Geometry Hall

Number of People	Cost
0	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	



1. How can the flat fee and the per person cost be used to draw the graph?

2. What is the point of intersection of the two lines? What does it represent?

3. Under what conditions is it best to go with Algebra Ballroom?

4. Under what conditions is it best to go with Geometry Hall?

4.1.2: What's My Equation? (Continued)

Problem C:

The yearbook club is considering two different companies to print the yearbook. The Descartes Publishing Company charges a flat fee of $475 plus $4.50 per book. School Memories charges a flat fee of $550 plus $4.25 per book. Which company should the yearbook club select to print this year's yearbook?

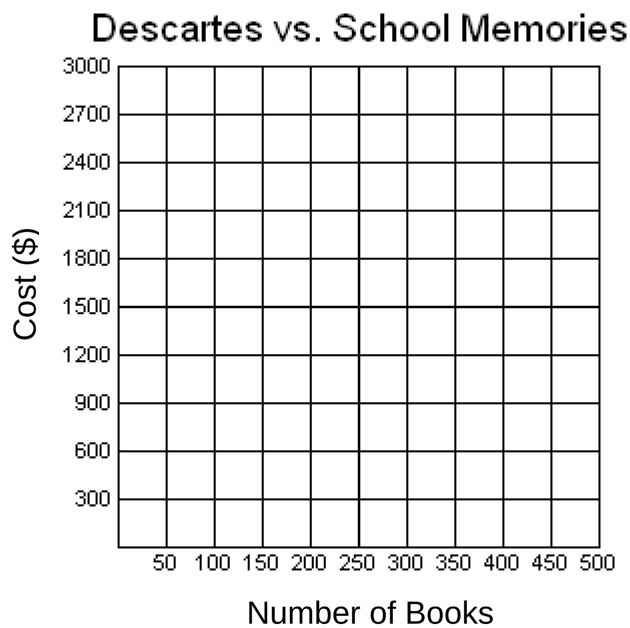
To solve the question complete the table of values, and the graph.

Descartes

Number of Books	Cost
0	
50	
100	
150	
200	
250	
300	
350	
400	
450	
500	

School Memories

Number of Books	Cost
0	
50	
100	
150	
200	
250	
300	
350	
400	
450	
500	



1. How can the flat fee and the cost per book be used to draw the graph?

2. What is the point of intersection of the two lines? What does it represent?

3. Under what conditions is it best to go with Descartes Publishing?

4. Under what conditions is it best to go with School Memories?

4.1.2: What's My Equation? (Continued)

Problem D:

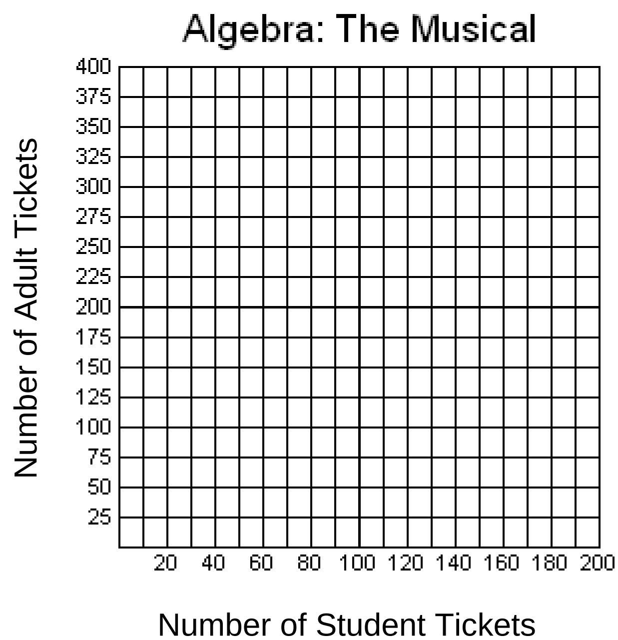
The school is putting on the play "Algebra: The Musical". Adult tickets were sold at a cost of $8 and student tickets were sold at a cost of $5. A total of 220 tickets were sold to the premiere and a total of $1460 was collected from ticket sales.
How many adult and student tickets were sold to the premiere of the musical?

To solve the question complete the table of values, and the graph.

Let x represent the # of student tickets sold
Let y represent the # of adult tickets sold

x	y
0	
40	
80	
120	
160	
200	

x	y
0	
40	
80	
120	
160	
200	



1. What is the approximate point of intersection of the two lines? What does it represent?

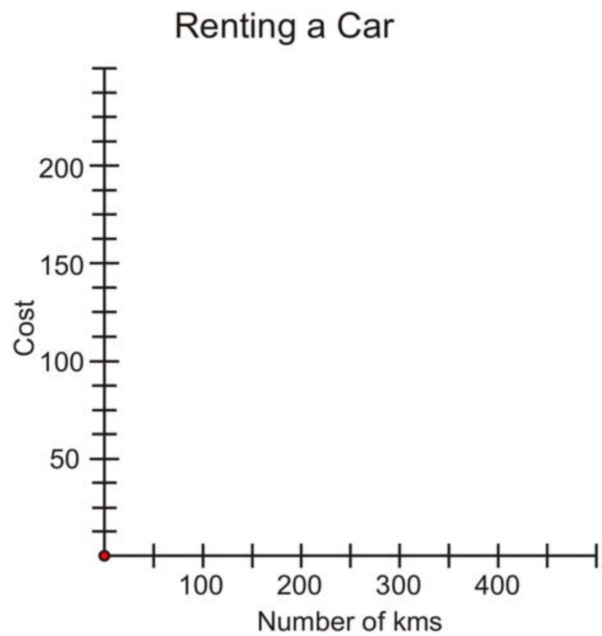
2. Does the rest of the graph (other than the POI) give us any information about the number of tickets sold?

4.1.3: Meaning of the Point of Intersection

1. Your family wants to rent a car for a weekend trip. **Cars R Us** charges $60.00 per weekend for a midsize car plus $0.20 per km. **Travel With Us** charges $0.50 per km.

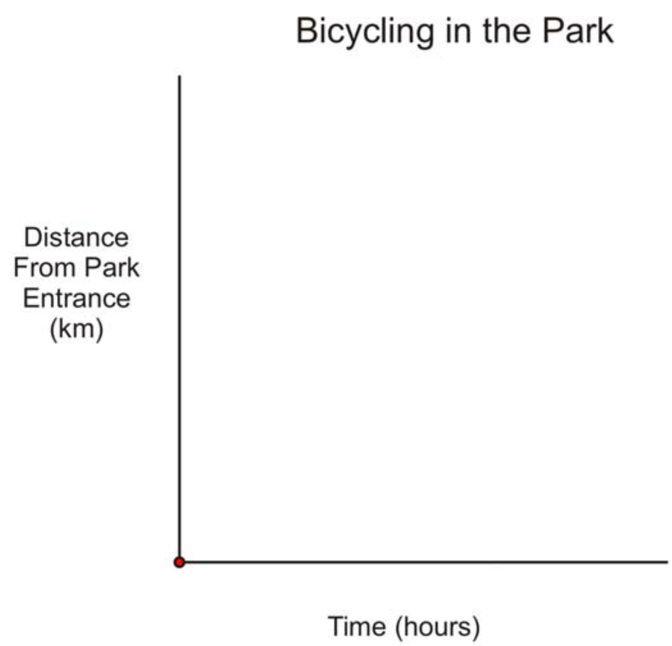
   a. Graph both options on the grid and determine the number of kilometres where both companies will cost the same amount.

   b. Explain what this means for your weekend trip.



2. Anthony and Anne are bicycling at a Provincial Park. Anthony travels at the rate of 10 km/hr and begins 2 km from the park entrance. Anne begins at the park entrance and travels at a rate of 15 km/hr. They both travel at a constant rate towards the Outdoor Education Centre.

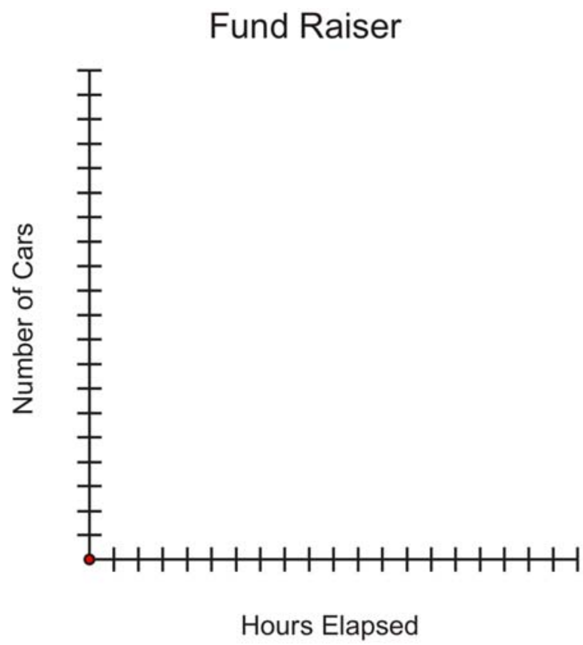
   Graph both routes on the grid and determine the meaning of the point of intersection.



4.1.3: Meaning of the Point of Intersection (Continued)

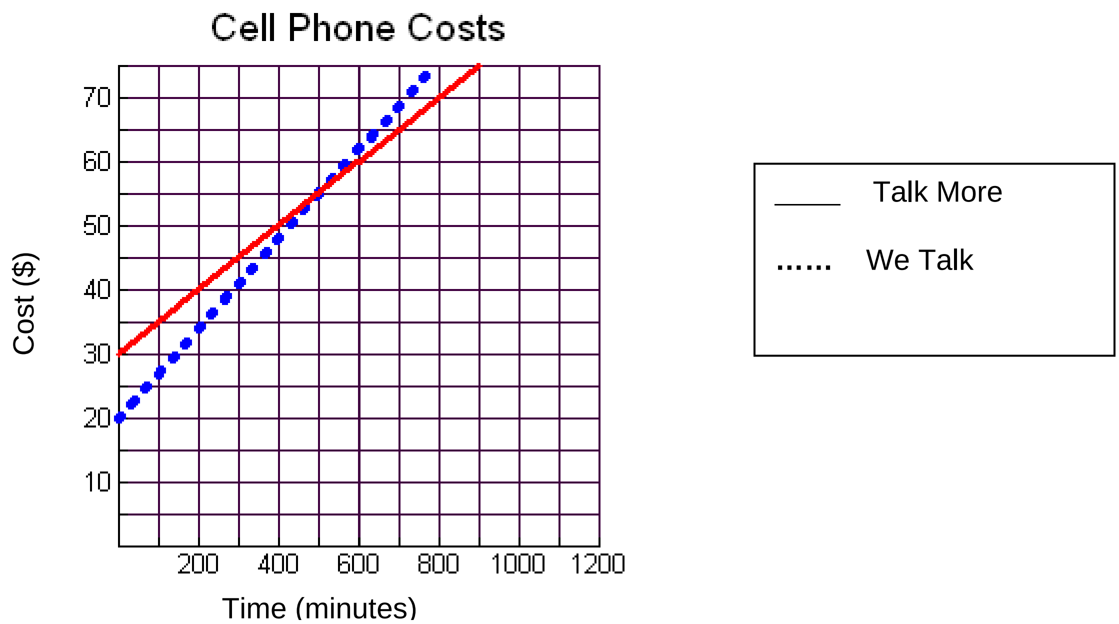
3. For a car wash fundraiser **Team A** washes 2 cars per hour starting a 7:00 a.m. **Team B** begins washing cars at 9:00 a.m. and washes 3 cars per hour.

   Graph the car washing progress of each team on the grid and determine the meaning of the point of intersection, as well as the meaning of the points before and after the point of intersection.



4.2.1: A Visual Cell Phone Problem

Two cell phone companies charge a monthly flat fee plus an additional cost for each minute of time used. The graph below shows the Time vs. Cost relationship, for one month.



1. What is the Point of Intersection (POI), and what is the meaning of the POI in relation to the cell phone plans?

2. Under what conditions is it best to use the Talk More cell phone plan?

3. Under what conditions is it best to use the We Talk cell phone plan?

4. How does the graph help you to determine which cell phone plan is the most appropriate at any given time?

4.2.2: Music is My Best Friend

iTones and Music Mine are two online music providers. Each company charges a monthly membership fee and then a per song download rate.

iTones charges $10 per month, and $1 per song $C = n + 10$

Music Mine charges $7 per month and $1.50 per song. $C = 1.5n + 7$

Where C represents the total cost for one month and *n* represents the number of songs purchased.

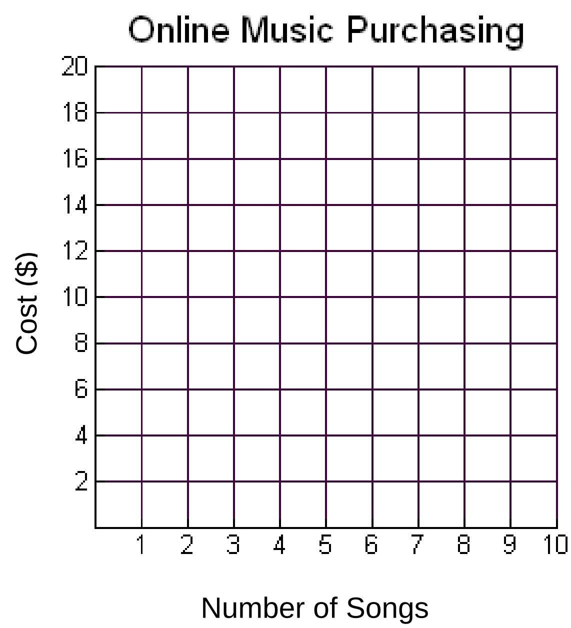
Create a table of values showing the total charges for up to 8 songs purchased.
Graph the lines on the same graph below.

iTones

N	***C***
0	
1	

Music Mine

n	***C***
0	
1	



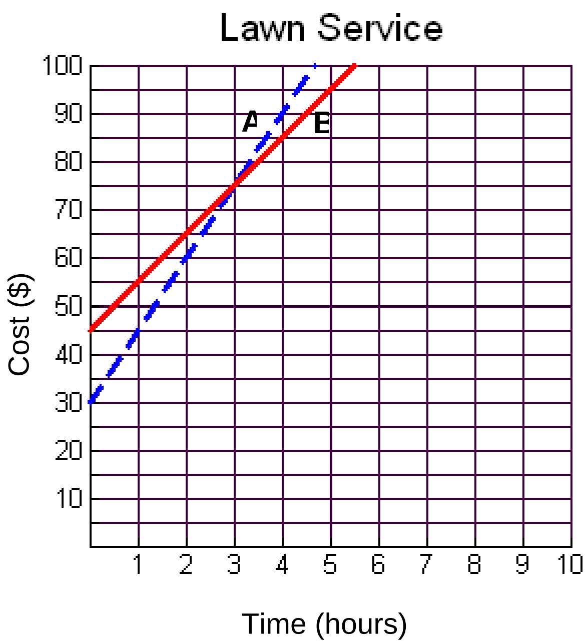
1. If Lulu plans to purchase 7 songs this month, which is the best plan for her? Explain.

2. Which plan is cheaper if you only plan to buy 4 songs per month? How do you know from the graph?

3. Which cell phone plan would you choose and why? Relate your answer back to the POI.

4.2.3: Where Do We Meet?

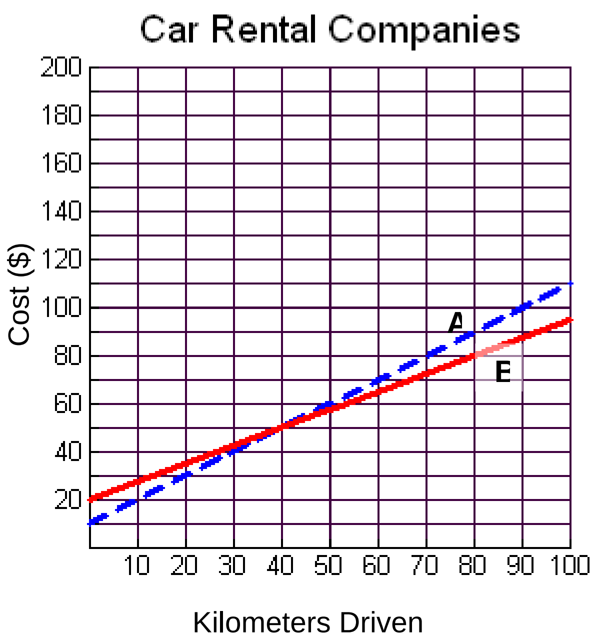
For each of the following situations, find the point of intersection and describe the meaning of this point. Describe which company or service you would choose under what circumstances. A template has been provided for the first situations.



Point of intersection:_____________

Interpretation of the point:

If the job lasts less than _____ hours, choose ______. If the job lasts more than ______ hours, choose _______. If the job lasts _______ hours, choose either company and the cost is______



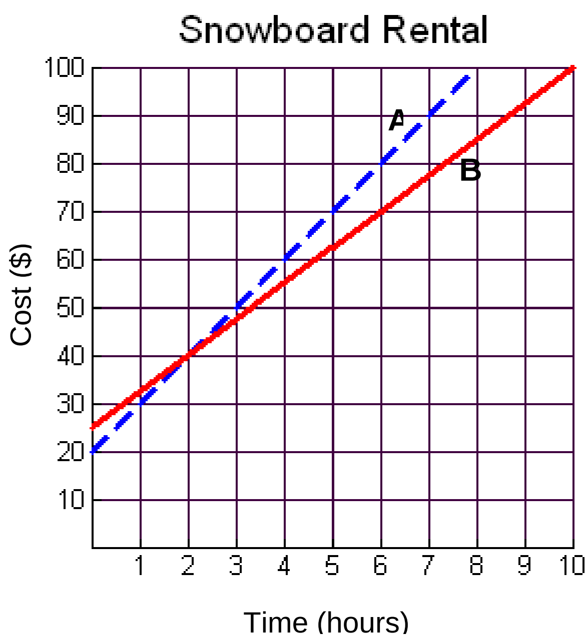
Point of intersection:_____________

Interpretation of the point:

If the kilometers driven is less than _____, choose ______. If the kilometers driven is more than ______, choose _______. If the kilometers driven is _______, choose either company and the cost is______

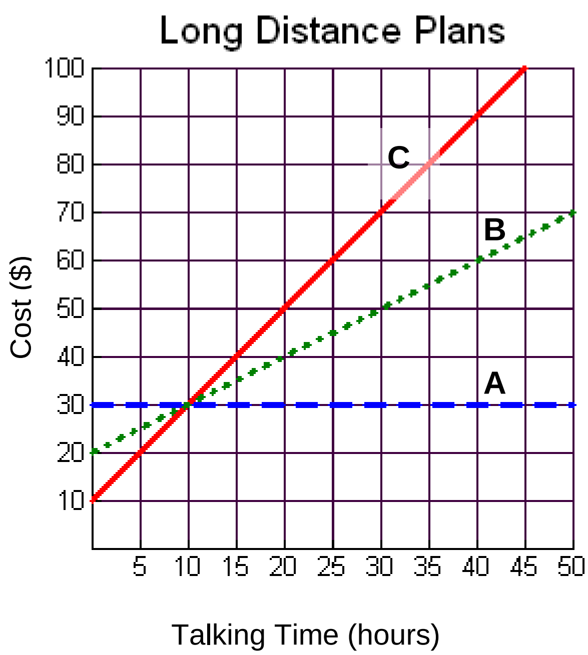
4.2.3: Where Do We Meet? (Continued)

For each of the following situations, find the point of intersection and describe the meaning of this point. Refer back to the template provided for the first situations.



Point of intersection:______________

Interpretation of the point:



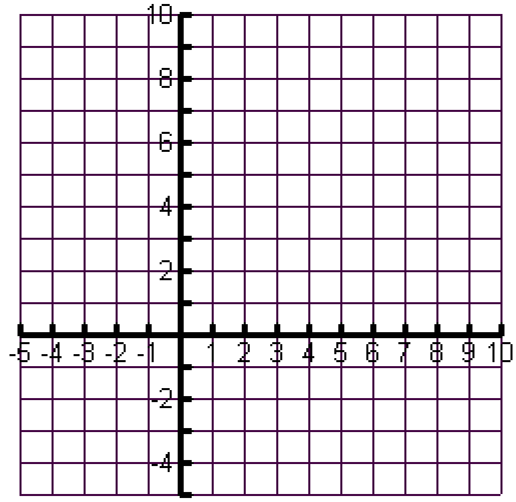
Point of intersection:______________

Interpretation of the point:

4.2.4: Does This Line Cross?

From the list of relations below, determine which lines cross through the point (2,3).
You may use the graph to assist you.

1. $y = 2x + 3$
2. $y = x + 1$
3. $y = -2x + 7$
4. $y = -3$
5. $x = 2$
6. $y = 2$



Questions:

1. Which of the lines passes through the point (2,3)?

2. Is there another way to determine if the line passes through the point, other than graphing? Explain.

3. Without graphing, how can you quickly determine if a horizontal or vertical line passes through a point?

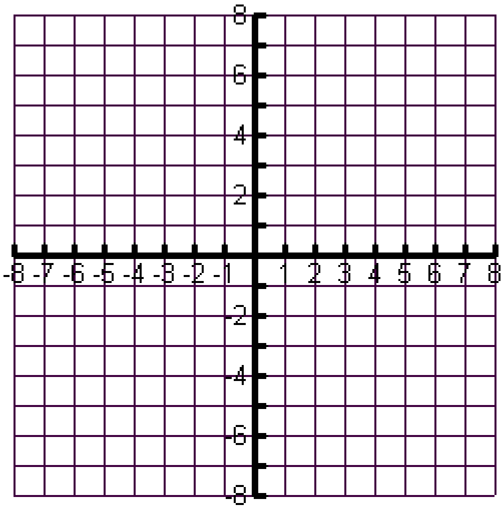
4. Other than the point (2, 3), what are the other points of intersection on your graph?

5. Is it possible for two lines to have more than one point of intersection **with each other**? Discuss this with your partner.

4.2.5: Is this Accurate?

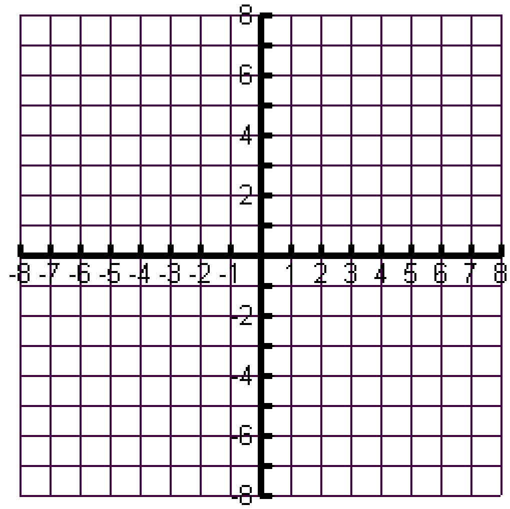
1. Find the point of intersection. (Solve the system using **graphical method**.)

a) $y = 2x + 1$
$y = 3x – 2$



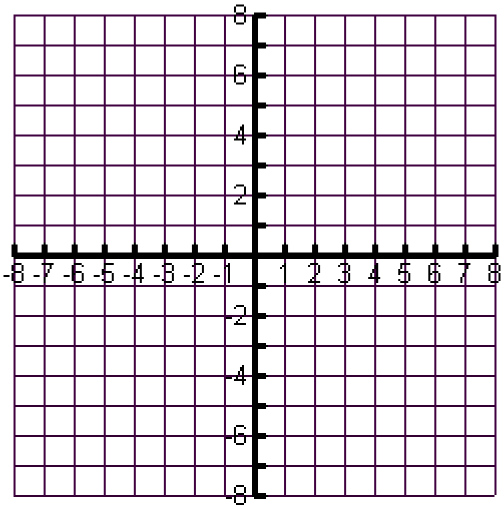
Point of intersection is :_______________

b) $y = -x -2$
$y = 2x + 7$



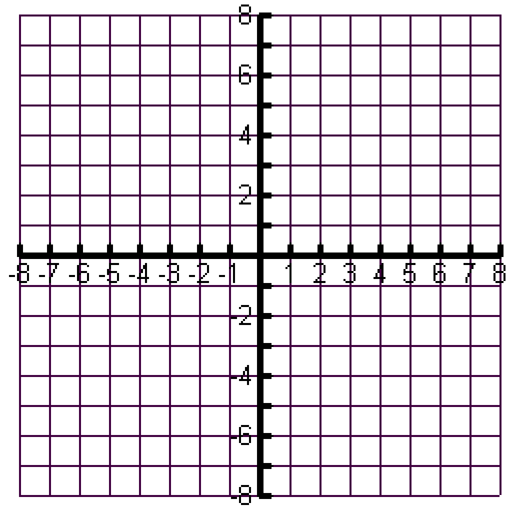
Point of intersection is:________________

c) $y = 2x + 1$
$y = 4x – 4$



Point of intersection is :_______________

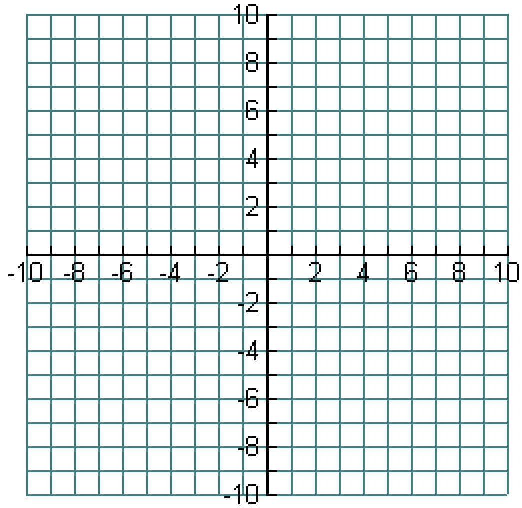
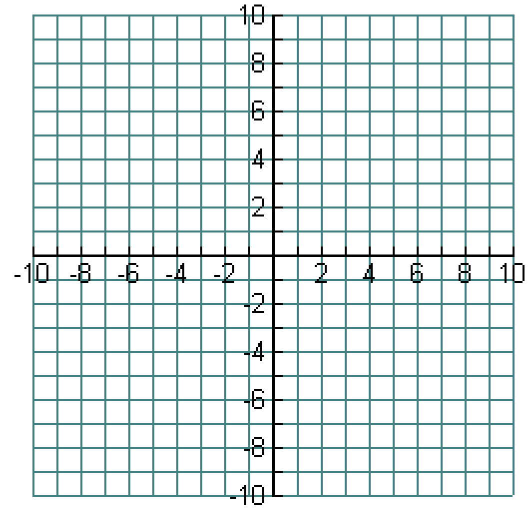
d) $y = -5$
$y = -3x+2$



Point of intersection is :_______________

4.3.1: What's my POI?

- Each one of you will **solve** one of the systems of equations given below.
- Once you have solved the system you were assigned, **trade** with your partner and **check** their solution. **Share** your feedback with your partner.
- Once you have shared your feedback and are confident in the solutions to the systems, **post** your point of intersection under the appropriate heading on the class list.

System A	System B
$y = \frac{1}{2}x - 1$ $y = -3x + 4$  Point of Intersection: (,)	$y = 2x + 7$ $y = -3x + 4$  Point of Intersection: (,)

4.3.2: A Better Way

Solve the following systems of equations **algebraically**. Use your CAS handheld to solve and check if needed.

1. Equation 1: $y + 2 = 10$ and Equation 2: $x + y = 12$

Point of intersection: (____, ____)

2. Equation 1: $3x + 2y = 33$ and Equation 2: $2x = x + 7$

Point of intersection: (____, ____)

In each of the systems you solved above, which equation did you choose to solve first? Why did you select that equation in each case?

4.3.3: Putting the Pieces Together

System 1: $y = 2x + 7$ and $y = -3x + 4$

Record the line that results once you have substituted, and then solve the equation using your CAS handheld.

Resulting equation and my solution. (Don't forget to solve for both variables.)	
Check your solution using the CAS handheld.	
Compare your solution to someone else in the class.	

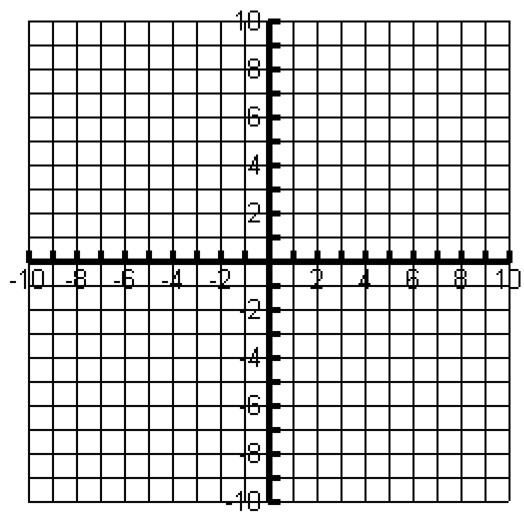
System 2: $-2x + y = 0$ and $x - y = 12$

Record the line that results once you have substituted, and then solve the equation using your CAS handheld.

Resulting equation and my solution. (Don't forget to solve for both variables.)	
Check your solution using the CAS handheld.	
Compare your solution to someone else in the class.	

4.3.4: The “Sub” Way

- In groups of three, have each person in the group solve one of the systems below.
- Use your CAS handheld to help you solve and check your system.
- Share your solutions with each person in the group.

System A	System B
$y = 4x + 24$ and $y = -5x – 12$	$13x + y = – 4$ and $5x + y + 4 = 0$
System C	**Challenge**
$y = -x – 8$ and $y = -5x$	**CHALLENGE**: Plot each of the POI's from Systems A, B, and C and find the equation of the line that connects the three points.  Equation of Line:______________________

4.3.5: What's My Equation? - Part 2

Part A
Let's return to our application problems that we solved graphically earlier in the unit. Assign each person in your group one of the three problems to solve. Solve these application problems using the method of substitution introduced today. Use the CAS handheld to help you solve.

Problem A:

Yasser is renting a car. Zeno Car Rental charges \$45 for the rental of the car and \$0.15 per kilometre driven. Erdos Car Rental charges \$35 for the rental of the same car and \$0.25 per kilometre driven. For what distance do the two rental companies charge the same amount?

Equations

$y = 45 + 0.15x$

$y = 35 + 0.25x$

Problem B:

The school council is trying to determine where to hold the athletic banquet. The Algebra Ballroom charges an \$800 flat fee and \$60 per person. The Geometry Hall charges a \$1000 flat fee and \$55 per person. For what amount of guests do the two banquet halls charge the same amount?

Equations

$y = 60x + 800$

$y = 55x + 1000$

Problem C:

The yearbook club is considering two different companies to print the yearbook. The Descartes Publishing Company charges a flat fee of \$475 plus \$4.50 per book. School Memories charges a flat fee of \$550 plus \$4.25 per book. For what amount of books do the two companies charge the same amount?

Equations

$y = 475 + 4.50x$

$y = 550 + 4.25x$

I am solving problem ___:

4.3.5: What's My Equation? - Part 2 (Continued)

Part B
Discuss the following questions with your group members.

1. Looking at your problem, how can you tell from the equation which company is cheaper before the point of intersection (where the costs are equal)?

2. Looking at your problem, how can you tell from the equation which company is cheaper after the point of intersection (where the costs are equal)?

3. Is this true for all problems?

4. Now that you've solved the problems using two different methods, which method do you prefer? Why?

5. When do you think solving by substitution would be preferable to solving by graphing?

4.4.1: The Lowdown on Downloads

Let's return to our music downloading problem. Here's the problem again.

iTones and Music Mine are two online music providers. Each company charges a monthly membership fee and then a per song download rate. iTones charges \$10 per month, and \$1 per song $C = x + 10$ Music Mine charges \$7 per month and \$1.50 per song. $C = 1.5x + 7$

1. Find the number of songs that I would need to download where the costs are the same for the two music providers.

2. Paris solved the problem and then made the following conclusion:

> *If you download less than 6 songs per month than choose iTones since the cost per song is less. If you download more than 6 songs per month than choose Music Mine since the fixed cost is less. If you download exactly 6 songs per month, choose either*

Is the conclusion that Paris made correct? If not, underline the part(s) of her conclusion that are incorrect and then rewrite it so that it is correct.

4.4.2: Putting the Pieces Together (Continued)

Solve the system: $y = 10 - 2x$ and $x - 2y = 10$

The steps to the solution to this system are given in the pieces below. Cut the pieces out and glue them in the correct order on a separate piece of paper. Use the handheld to help you. **Hint: There are 10 steps in the complete solution.**

✂

$x - 2(10 - 2x) = 10$	$-x = 20$
$x = 6$	*Point of Intersection: (6,-2)*
$x - 20 - 4x = 10$	$y = 10 - 12$
$y = 14$	$x - 10 - 2x = 10$
$y = -2$	$y = 10 - 2(6)$
$5x = 10 + 20$	$x = 30/5$
$-x = 10 + 10$	$5x = 30$
$x = -20$	$x - 20 + 4x = 10$
$x = -2$	*Point of Intersection: (-2,6)*

4.4.3: An Interesting Problem

Consider the following three systems of equations:

System A	System B	System C
$x + 2y = 3$ and $4x + 5y = 6$	$-2x + y = 4$ and $7x + 10y = 13$	$-5x - 3y = -1$ and $x + 3y = 5$

1. In order to solve these systems by substitution, we need to first **isolate one variable in one equation**. Circle the variable in each system that would require just **one** step to isolate. Compare your choice with a neighbour.

2. Using your handheld to help you, isolate the variable you selected in #1 for each system.

System A	System B	System C

3. Assign each system to one person in your group and solve the system assigned to you in the space below. Use your handheld to help solve and check.

I am solving system _____:

Point of Intersection (_____, _____)

4. Compare your solution to the rest of the group. What do you notice?

4.4.3: An Interesting Problem (Continued)

5. The chart below lists out only the numbers that appear in each system. What do you notice about the numbers in each system?

System A	System B	System C
1, 2, 3, 4, 5, 6	*-2, 1, 4, 7, 10, 13*	*-5, -3, -1, 1, 3 , 5*

6. Let's see if this works with more systems. Each system below has only one equation given. Assign each system to one person in the group and create a second equation that will give the solution (-1, 2) when solved.

System A	System B	System C
Equation 1: $x + 6y = 11$ *Equation 2:* ______________	*Equation 1: $-14x – 9y = -4$* *Equation 2:* ______________	*Equation 1: $9x + 7y = 5$* *Equation 2:* ______________

7. Share your equation with everyone in the group and copy down the equations from the rest of the group. Review the equations created and make sure they follow the rule that you noted in #5. You will solve these three systems as a part of your home activity.

4.4.4: The Sub Steps

Solving using the method of substitution requires five steps. The steps are given below in the text boxes. Discuss with your partner what you think the correct order is for the steps and then write the steps in the space provided. Solve the system in the chart as model of solving by substitution. Check using your handheld.

State the point of intersection.

Solve the resulting equation.

Substitute the isolated expression into the other equation.

Substitute your solution into an original equation to solve for the other variable.

Isolate for a variable. The easiest variable to isolate for has a coefficient of 1.

Steps for Solving by Substitution	Example: Solve $4x + y = 6$ and $2x - 3y = 10$

4.5.1: A Trip to Jim Hortons

It's summer vacation. Ah, sweet freedom. The only problem is that you're the designated coffee gopher at the office where you have a summer job. On Monday, you were sent out to Jimmies to pick up five small coffees and seven extra large coffees. You remember that the total cost was $14.95, including tax. On Tuesday, you were sent out to get three small coffees and seven medium coffees. You recall that the total came to $12.75, with tax.

It's Wednesday morning and your coffee crazy co-workers are calling for their cup o' joe. Unfortunately, since the morning fix hasn't arrived yet, no one can remember how much a small or extra large coffee costs, including yourself. You need to find out how much each size costs to collect the correct amount of money for the Wednesday coffee run.

1. Let s be the number of small coffees ordered on a single day.

   Let e be the number of extra large coffees ordered on a single day.

   As a class, can we decide on an equation to represent the purchases made on Monday, and an equation to represent the purchases made on Tuesday?

   Monday's equation: ____

   Tuesday's equation: ____

2. Now we have a linear system. Take a few minutes to solve the linear system using substitution in the space below. Then pair with another student to discuss your solution.

3. What problems, if any, did you encounter?

4.5.2: An Elimination Introduction

You know that two integers can be added, or subtracted:

$$\begin{array}{r} 5 \\ +\underline{\ 7} \\ 12 \end{array} \qquad\qquad \begin{array}{r} 15 \\ -\underline{\ 6} \\ 9 \end{array}$$

In the same way, equations can be added, or subtracted:

$$+\begin{array}{rcl} 3x + 2y &=& 19 \\ \underline{5x - 2y} &\underline{=}& \underline{\ \ 5} \\ 8x \qquad &=& 24 \end{array} \qquad\qquad -\begin{array}{rcl} 10x + 20y &=& 80 \\ \underline{10x + 15y} &\underline{=}& \underline{25} \\ 5y &=& 55 \end{array}$$

Notice that by adding the equations in the first linear system, the y variable was eliminated (there were 0y), which makes it possible to solve for x.

By subtracting the equations in the second linear system, the x variable was eliminated (there were 0x), which makes it possible to solve for y.

1. Work in pairs to consider the following linear systems. Decide what operation – addition or subtraction – would result in the elimination of a variable. You may use CAS on the handheld to help you decide.

$$\begin{array}{rcl} 9x + y &=& 4 \\ \underline{14x + y} &\underline{=}& \underline{-1} \end{array} \qquad \begin{array}{rcl} 3x - y &=& 50 \\ \underline{12x + y} &\underline{=}& \underline{115} \end{array} \qquad \begin{array}{rcl} -7x - 6y &=& 338 \\ \underline{9x + 6y} &\underline{=}& \underline{-366} \end{array}$$

$$\begin{array}{rcl} 18x - 5y &=& 454 \\ \underline{12x - 5y} &\underline{=}& \underline{316} \end{array} \qquad \begin{array}{rcl} 19x + 2y &=& 102 \\ \underline{19x - 2y} &\underline{=}& \underline{50} \end{array} \qquad \begin{array}{rcl} 17x - 8y &=& 323 \\ \underline{6x + 8y} &\underline{=}& \underline{114} \end{array}$$

$$\begin{array}{rcl} 9x - 4y &=& 235 \\ \underline{15x + 2y} &\underline{=}& \underline{409} \end{array} \qquad \begin{array}{rcl} 7x - 16y &=& 441 \\ \underline{7x - 17y} &\underline{=}& \underline{476} \end{array} \qquad \begin{array}{rcl} 5x - 3y &=& 188 \\ \underline{6x - 11y} &\underline{=}& \underline{344} \end{array}$$

2. What needs to be true about a linear system so that a variable is eliminated when the equations are added or subtracted?

4.5.3: Solving a Linear System by Elimination

1. How would you begin solving this linear system? Addition or Subtraction?

$$\begin{array}{l} 5x + 4y = 7 \\ \underline{3x - 4y = 17} \end{array}$$

2. Solve the system.

3. In your own words, describe what you must do to solve a linear system by elimination.

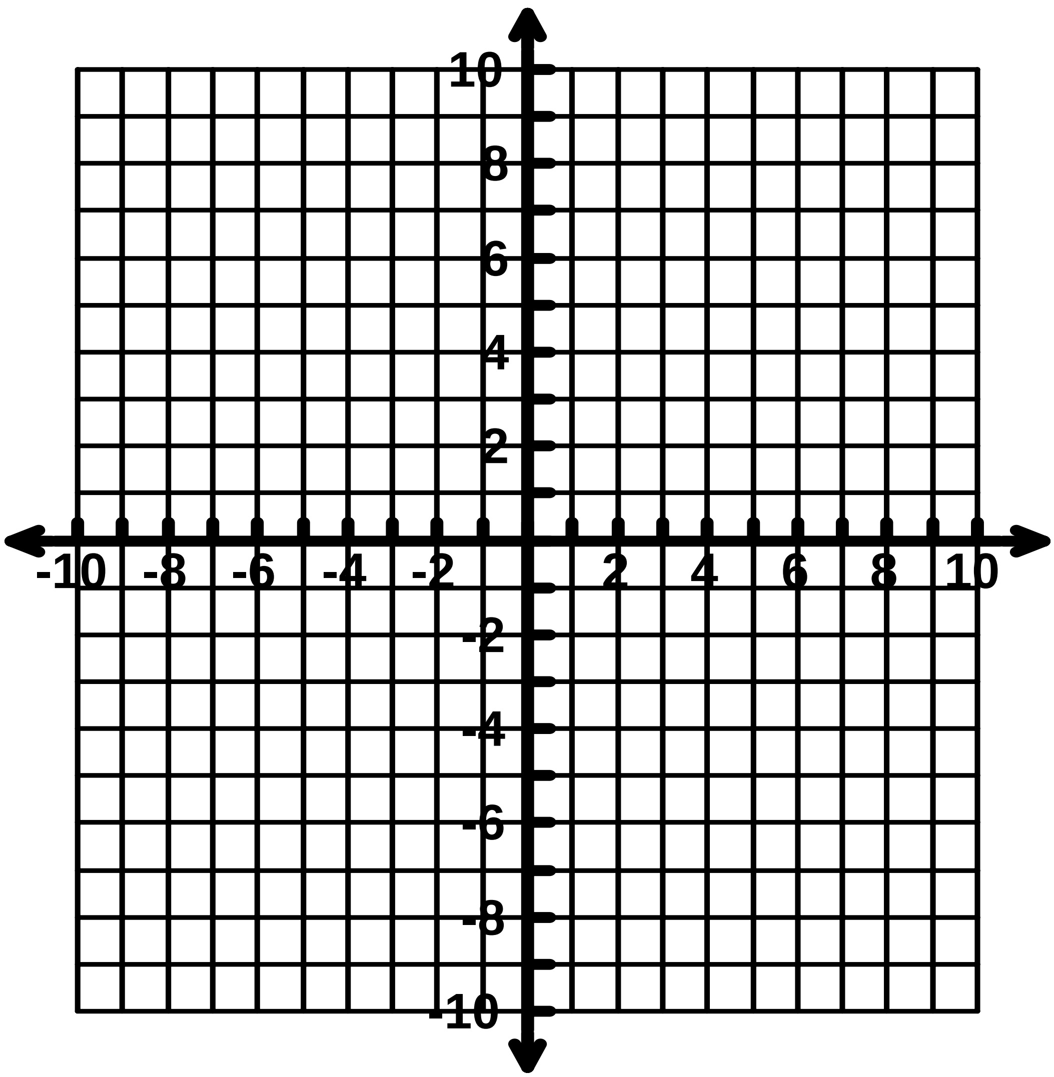
4.6.1: What's the difference?

Original equation: $x + 2y = 6$

Multiply the equation by the constant ______. The new equation is _____________________.

Complete the table of values for your equation and plot the values on the grid provided.

x	-4	-2	0	2	4
y					



4.6.2: Elimination Preparation

1. Consider the following linear system:

$$\begin{aligned} 3k + 15m &= 15 \\ -k - m &= -1 \end{aligned}$$

   If you add or subtract the equations, will a variable be eliminated? Explain.

2. What could be done to create the conditions necessary for elimination?

4.6.3: Algebra, the Musical - Redux

Recall that in the first lesson of this unit, you solved the following problem by graphing:

> The school is putting on the play “Algebra: The Musical”. Adult tickets were sold at a cost of $8 and student tickets were sold at a cost of $5. A total of 220 tickets were sold to the premiere and a total of $1460 was collected from ticket sales. How many adult and student tickets were sold to the premiere of the musical?

If x represents the number of student tickets sold, and y represents the number of adult tickets sold, then the equations that model this problem are:

(from cost of tickets)	$5x + 8y = 1460$
(from number of tickets sold)	$x + y = 220$

You probably remember that this problem took a while to solve by graphing, and the answer you found was not necessarily very accurate, since you read the point of intersection off of the graph.

You will work with a partner now to solve this problem using the method of elimination.

1. Since you have been asked to eliminate the *x or y variable* **(circle one)** first, what will be the first step you take to create the conditions necessary for elimination?

2. Solve the linear system now. You may use CAS to help find the answer and check the solution. Use the space below for rough work.

3. Does it matter which variable is eliminated first? That is, does it change the final answer?

4. Think back to when you solved this problem by graphing. Do you find the method of elimination easier or harder? Explain.

4.6.4: Two for You

Try solving the following questions using the method of elimination. You may use CAS on the handhelds to help solve the questions and check your solutions.

1. A fitness club charges an annual fee and an hourly fee. In a single year, member A worked out for 76 hours and paid $277 in total. Member B worked out for 49 hours and paid $223 in total. What is the annual fee? What is the hourly fee?

   HINT: Start by writing "let" statements to define the variables you will use. For example:

   Let ***a*** represent the amount of the annual fee.
   Let ***h*** represent the amount of the hourly fee.

2. This past summer, you ran a food booth at a local festival. You sold hotdogs for $1 each and samosas for $2.50 each. From 205 purchases, you made $400 in total. To help plan purchases for next year's festival, you'd like to know how many hotdogs and samosas were sold. Unfortunately, you forgot to keep track of this when selling the food. Can you determine how many hotdogs and samosas were sold?

   NOTE: Assume one hotdog **or** one samosa per purchase.

4.6.5: Help an Absent Friend

Consider the following linear system:

$$2x + 3y = 1$$
$$3x - y = 7$$

How would you solve it? Write in words a description of the steps you would take.

To help you understand what to write, pretend for a moment that you are writing the instructions for a friend who is not in class today. What steps would you need to describe?

4.6.6: "Here's To The Crazy Ones"

1. Solve the following linear system by elimination:

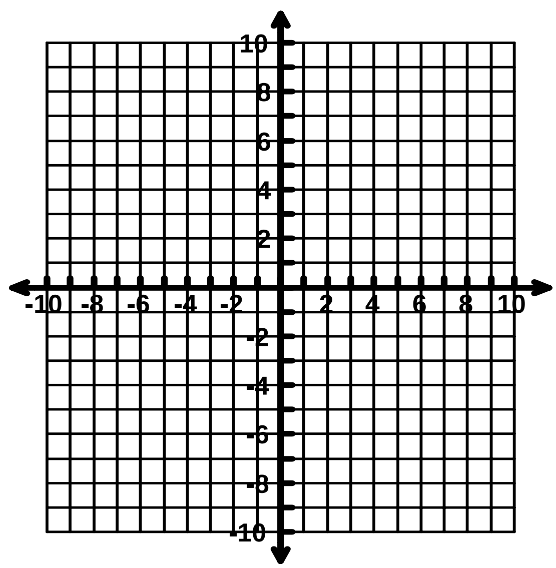
$$4x + 2y = 12$$
$$8x + 4y = 32$$

2. Did you encounter any results that are unusual? Explain what is different compared to questions you have already solved.

3. Re-arrange each equation from the linear system into $y = mx + b$ form, then graph.

For example, here is how the first equation can be re-arranged:

$$\begin{aligned} 4x + 2y &= 12 \\ 2y &= -4x + 12 \\ \frac{2y}{2} &= \frac{-4x}{2} + \frac{12}{2} \\ y &= -2x + 6 \end{aligned}$$



4. What do you notice about the <u>slope</u> in each equation that you re-arranged? What do you notice about how the two lines visually relate to each other? Is there a solution to this linear system?

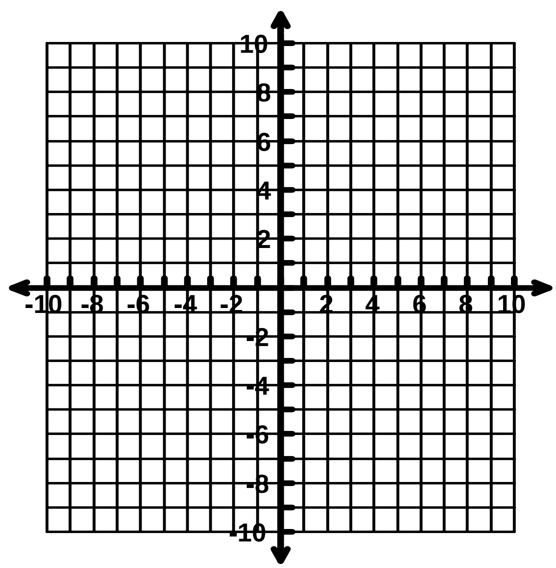
4.6.6: "Here's To The Crazy Ones" (Continued)

5. Solve the following linear system by elimination:

$$\begin{aligned} 6x + 2y &= 2 \\ 12x + 4y &= 4 \end{aligned}$$

6. Did you encounter any results that are unusual? Explain what is different compared to questions you have already solved.

7. Re-arrange each equation from the linear system into $y = mx + b$ form, then graph.



8. What do you notice about the <u>slope</u> and <u>y-intercept</u> in each equation that you re-arranged? What do you notice about how the two lines visually relate to each other? Is there a solution to this linear system? If so, how many?

4.7.3: Which Method?

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For **System A** determine if you can solve the system using each of the three methods you have learned, and if you can, then solve.

$$2x+3y=10$$
$$-4x+5y=2$$

Justify why you can or cannot solve using this method.

</td>
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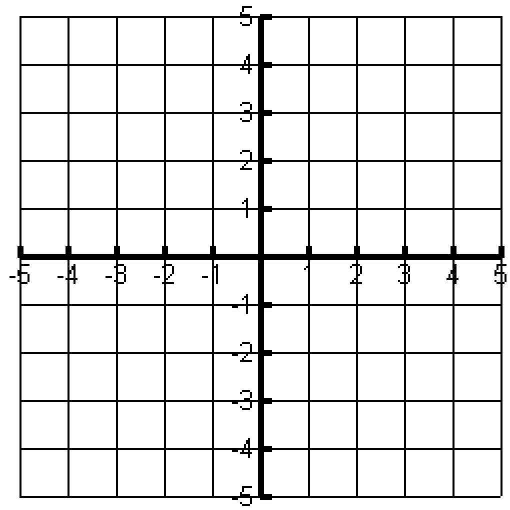
Graphing:



Justification:

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Substitution:

Justification:

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Elimination:

Justification:

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4.7.3: Which Method? (Continued)

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For **System B** determine if you can solve the system using each of the three methods you have learned, and if you can, then solve.

$$y = x - 2$$

$$x + 5y = -4$$

Justify why you can or cannot solve using this method.

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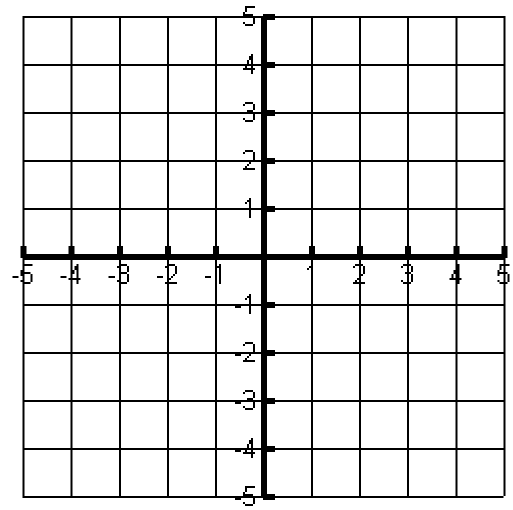
Graphing:



Justification:

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Substitution:

Justification:

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Elimination:

Justification:

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4.7.3: Which Method? (Continued)

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For System C determine if you can solve the system using each of the three methods you have learned, and if you can, then solve.

$$y = 2x - 7$$
$$y = -4x + 5$$

Justify why you can or cannot solve using this method.
</td>
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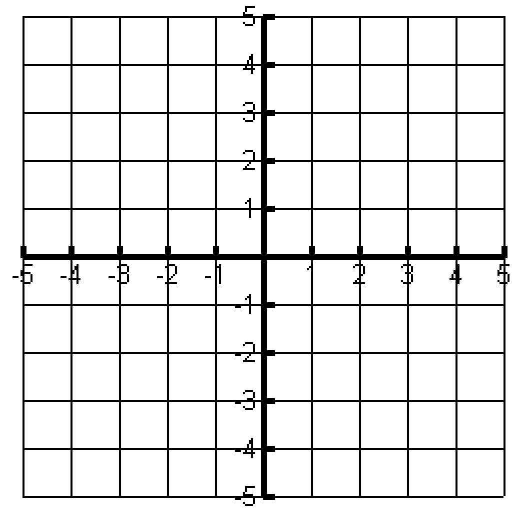
Graphing:



Justification:
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<td>
Substitution:

Justification:
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Elimination:

Justification:
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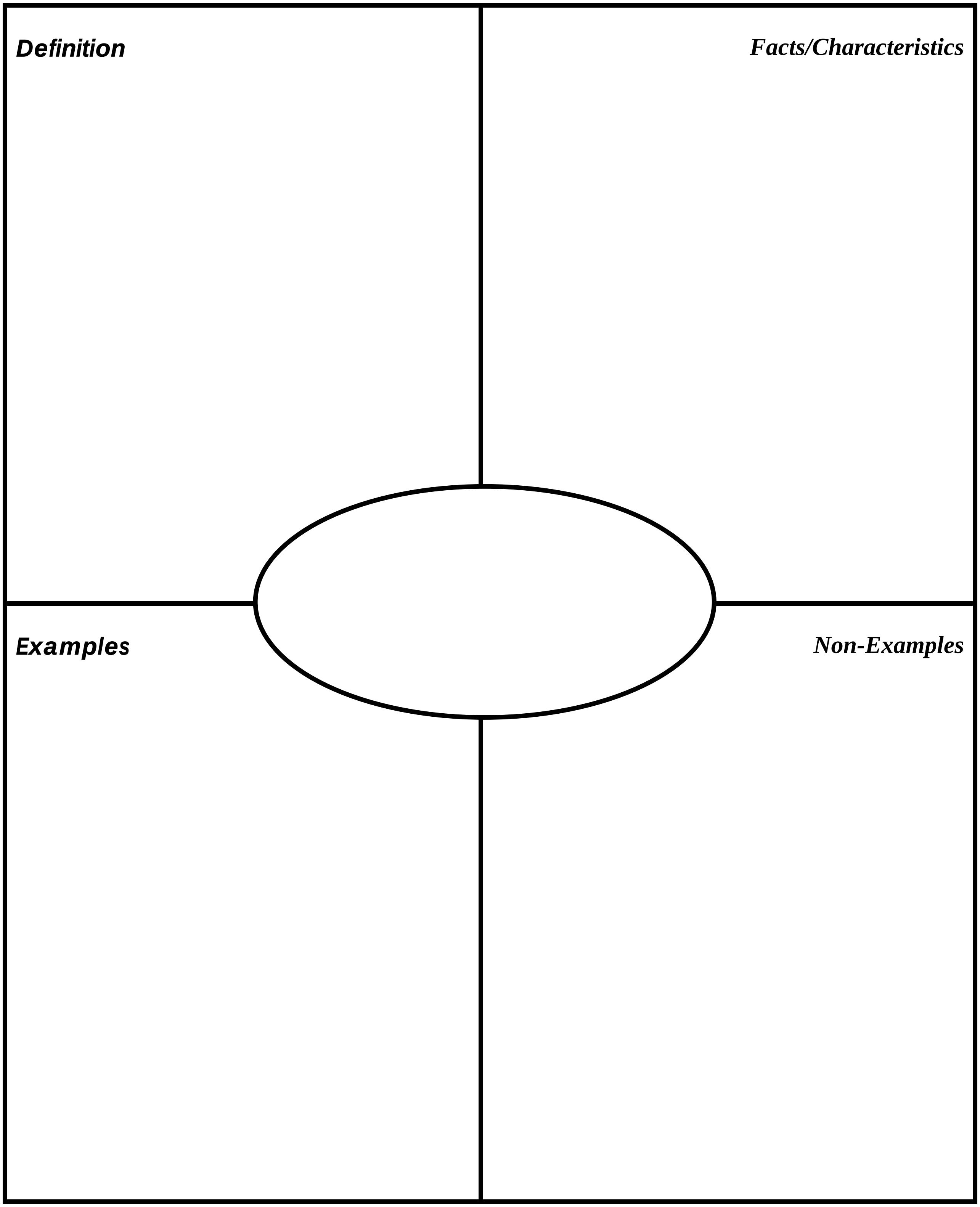
4.7.4: The Frayer Model



4.7.5: 3 Ways

Two catering companies provide food and the banquet hall for weddings, proms and anniversaries. Nick and Heather are getting married in September and they have two catering companies to choose from:

Cookie's Catering	**Frugal Gourmet**
Cesaer Salad Chicken Picatta Roasted Potatoes Steamed Vegetables Sherbert Coffee or Tea	Minestrone Soup Mixed green salad Prime Rib Garlic Mashed Potatoes Asparagus Apple Pie Coffee or Tea

The cost(C) for the different menu options includes the cost of the hall rental and price per person(n).

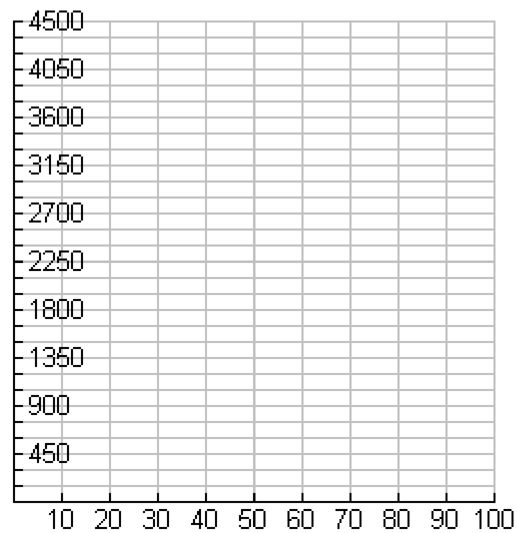
Cookie's Catering: C= 40n+500

Frugal Gourmet: C=45n+350

Cookie's Catering

Frugal Gourmet

Solve the system using the graphing method:



Point of intersection:___________________

4.7.5: 3 Ways (Continued)

Solve the system using substitution Point of intersection:_______________	Solve the system using elimination Point of intersection:_________________
What does the point of intersection mean in this catering problem?	You used 3 different methods to solve the system, what did you notice about the points of intersection? Does this surprise you?
Nick and Heather have invited 80 people to their wedding. How much will it cost for each menu?	Heather prefers the Frugal Gourmet menu to Cookie's Catering. How much more will she pay for her preference?

4.7.5: 3 Ways (Continued)

The student council is providing lunch and music for the grade 10 class. They have two quotes from Lunch Express and Let's Do Lunch. The costs for each were given as follow:
Lunch Express: If 100 students attend, it will cost $1 000. If 200 students attend, it will cost $1 500.

Let's Do Lunch: If 50 students attend, it will cost $700. If 150 students attend, it will cost $1 350.

Solve the system using the three different methods.

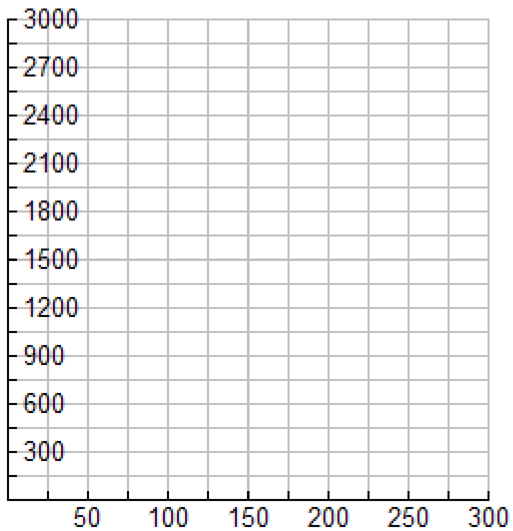
Equations for the companies:

Lunch Express:______________ **Let's Do Lunch**:____________________________

Lunch Express

Let's Do Lunch

Graphing Method



Point of intersection:__________________

Substitution Method

Point of intersection:__________________

4.7.5: 3 Ways (Continued)

Elimination Method Point of intersection:____________________	The student council has $1 800 in their budget for the lunch. They prefer **Let's Do Lunch**, what is the greatest number of grade 10 students they can have at the lunch?
What does the ordered pair (25,750) mean on the **Lunch Express** line?	

4.S: Unit Summary Page

Unit Name: ____

Using a graphic organizer of your choice create a unit summary.

4.R: Reflecting on My Learning (3, 2, 1)

3 Things I know well from this unit
2 Things I need explained more
1 Question I still have

4.RLS: Reflecting on Learning Skills

Students should be aware of the importance that these skills have on your performance. After receiving your marked assessment, answer the following questions. Be honest with yourself. Good Learning Skills will help you now, in other courses and in the future.

- E – Always
- G – Sometimes
- S – Need Improvement
- N – Never

Organization
- E G S N I came prepared for class with all materials
- E G S N My work is submitted on time
- E G S N I keep my notebook organized.

Work Habits
- E G S N I attempt all of my homework
- E G S N I use my class time efficiently
- E G S N I limit my talking to the math topic on hand
- E G S N I am on time
- E G S N If I am away, I ask someone what I missed,
- E G S N I complete the work from the day that I missed.

Team Work
- E G S N I am an active participant in pairs/group work
- E G S N I co-operate with others within my group
- E G S N I respect the opinions of others

Initiative
- E G S N I participate in class discussion/lessons
- E G S N When I have difficulty I seek extra help
- E G S N After I resolve my difficulties, I reattempt the problem
- E G S N I review the daily lesson/ideas/concepts

Works Independently
- E G S N I attempt the work on my own
- E G S N I try before seeking help
- E G S N If I have difficulties I ask others but I stay on task
- E G S N I am committed to tasks at hand

Yes No I know all the different ways available in my school, where I can seek extra help.

Yes No I tried my best.

What will I do differently in the next unit to improve?

___

___

___

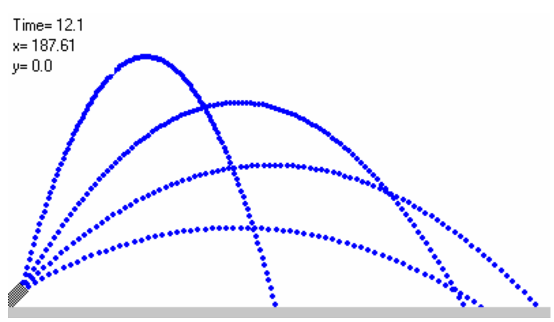
TIPS4RM

Targeted Implementation and Planning Supports for Revised Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Course: Grade 10 Applied Mathematics (MFM2P)

Unit 5: Introduction to Quadratic Relations



Dufferin-Peel Catholic District School Board

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August 2008

Unit 5
Introduction to Quadratic Relations

5.1.1: Going Around the Curve

Experiment A

A particular mould grows in the following way: If there is one “blob” of mould today, then there will be 4 tomorrow, 9 the next day, 16 the next day, and so on.
Model this relationship using linking cubes.

Purpose

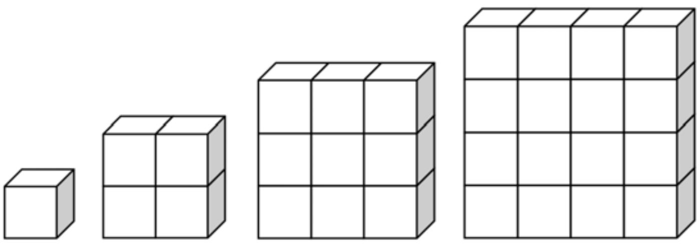
Find the relationship between the side length and the number of cubes.

Hypothesis

What type of relationship do you think exists between the side length and the number of cubes?

Procedure

1. Build the following sequence of models, using the cubes.

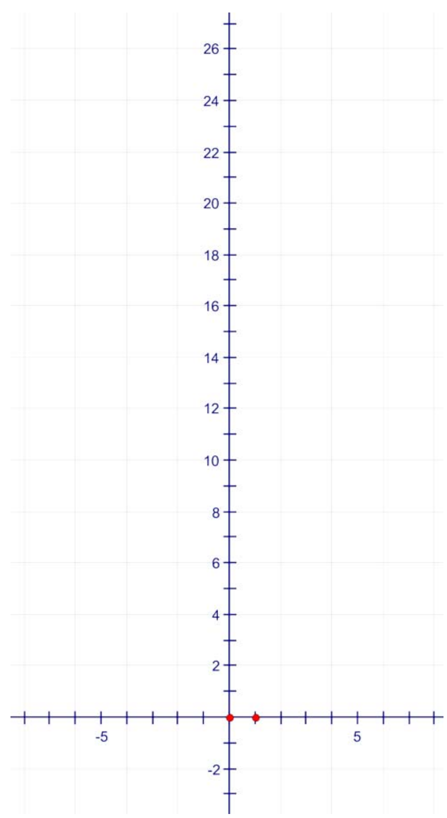


2. Build the next model in the sequence.

Mathematical Models

Complete the table, including first and second differences.
Make a scatter plot and a line of best fit.

Side Length	Number of Cube	First Differences	Second Difference
0	0		



5.1.2: Going Around the Curve

Experiment B

Jenny wants to build a square pool for her pet iguana. She plans to buy tiles to place around the edge to make a full play area for her pet.
Model the relationship, comparing total play area (pool combined within the edging) to the side length of the pool, using linking cubes.

Purpose

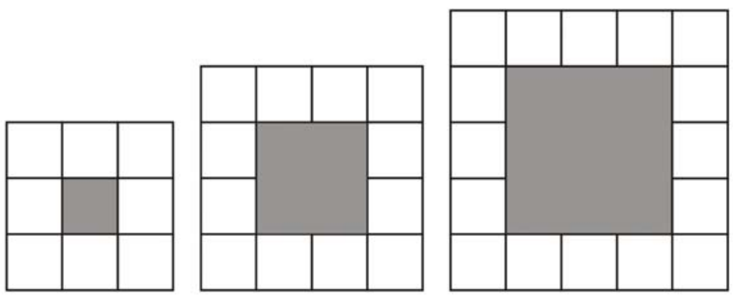
Find the relationship between the side length of the pool (shaded inside square) and the total play area.

Hypothesis

What type of relationship do you think exists between the side length and the play area?

Procedure

1. Build the following sequence of models using the cubes.
   Note: The pool is the shaded square, the tiles are white.

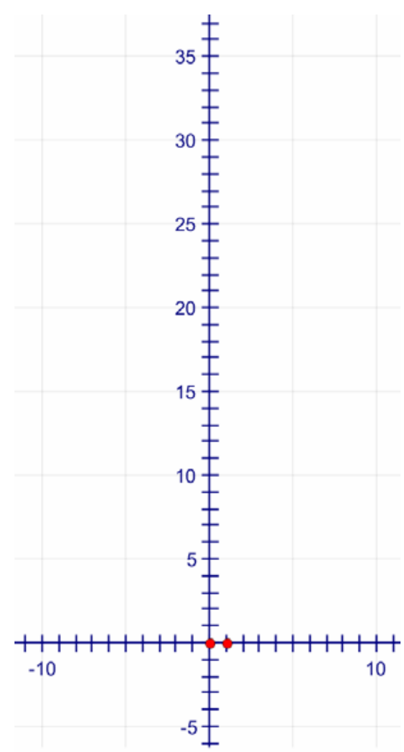


2. Build the next model in the sequence.

Mathematical Models

Complete the table, including first and second differences.
Make a scatter plot and a line of best fit.

Side Length	Total Play Area	First Differences	Second Difference
1			



5.1.3: Going Around the Curve

Experiment C

A particular mould grows in the following way: If there is one “blob” of mould today, then there will be 3 tomorrow, and 6 the next day.
Model this relationship using linking cubes.

Purpose

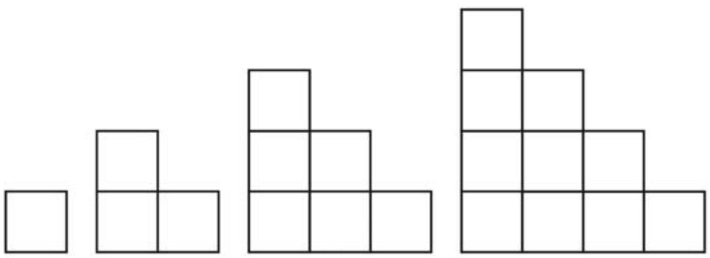
Find the relationship between the number of cubes in the bottom row and the total number of cubes.

Hypothesis

What type of relationship do you think exists between the number of cubes in the bottom row and the total number of cubes?

Procedure

1. Build the following sequence of models using the cubes.

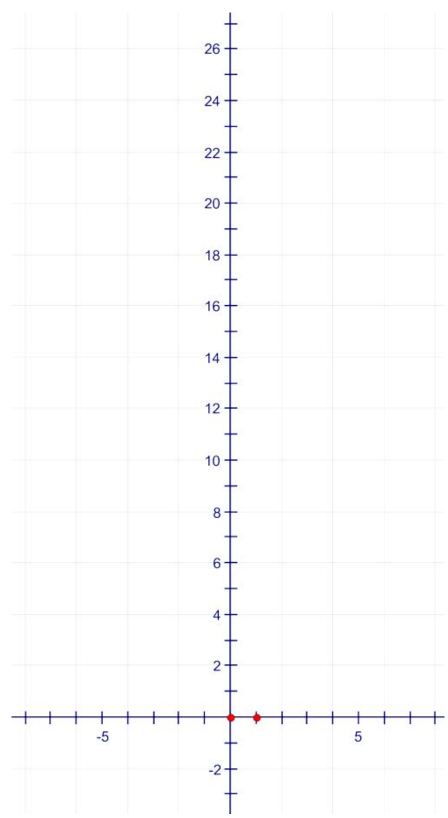


2. Build the next model in the sequence.

Mathematical Models

Complete the table, including first and second differences.
Make a scatter plot and a line of best fit.

Number of Cubes in the Bottom Row	Total Number of Cubes	First Differences	Second Difference



5.1.4: Going Around the Curve

Experiment D

Luisa is designing an apartment building in a pyramid design. Each apartment is a square.
She wants to know how many apartments can be built in this design as the number of apartments on the ground floor increases.
Model this relationship, using linking cubes.

Purpose

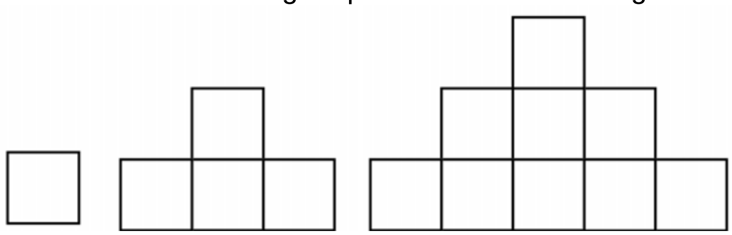
Find the relationship between the number of cubes in the bottom row and the total number of cubes.

Hypothesis

What type of relationship do you think exists between the number of cubes in the bottom row and the total number of cubes?

Procedure

1. Build the following sequence of models using the cubes.

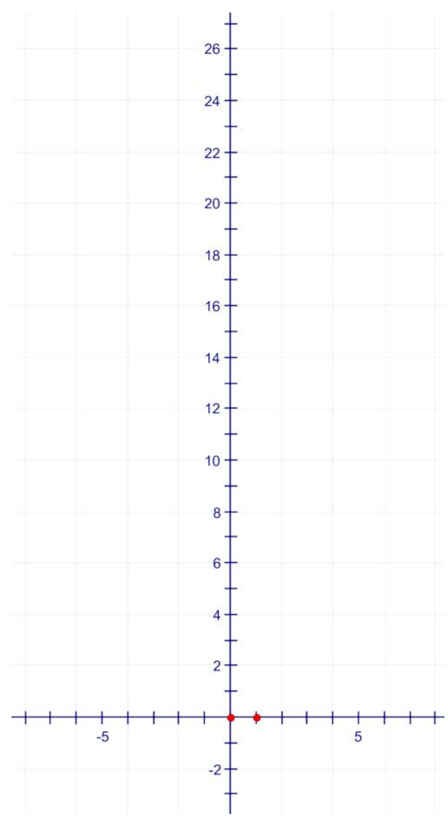


2. Build the next model in the sequence.

Mathematical Models

Complete the table, including first and second differences.
Make a scatter plot and a line of best fit.

Number of Cubes in the Bottom Row	Total Number of Cubes	First Differences	Second Difference
0	0		



5.1.5: Going Around the Curve

Experiment E

Liz has a beautiful pond in her yard and wants to build a tower beside it using rocks. She is unsure how big she will make it and how many rocks she will need. She is particularly concerned to have the nicest rocks showing.
Model the relationship comparing the length of the base to the number of visible rocks using linking cubes.

Purpose

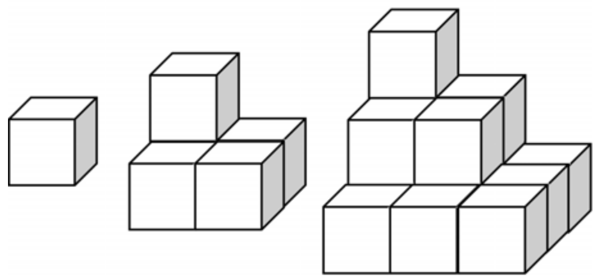
Find the relationship between the number of cubes on the side of the base and the total number of unhidden cubes.

Hypothesis

What type of relationship do you think exists between the length of the side of the base and the number of visible cubes?

Procedure

1. Build the following sequence of models using the cubes.

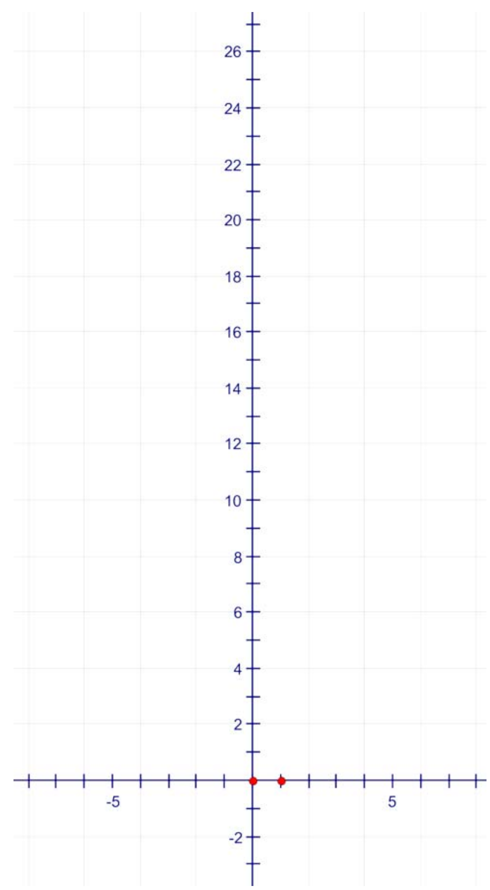


2. Build the next model in the sequence.

Mathematical Models

Complete the table, including first and second differences.
Make a scatter plot and a line of best fit.

Length of Side of Base	Total Number of Unhidden Cubes	First Differences	Second Difference

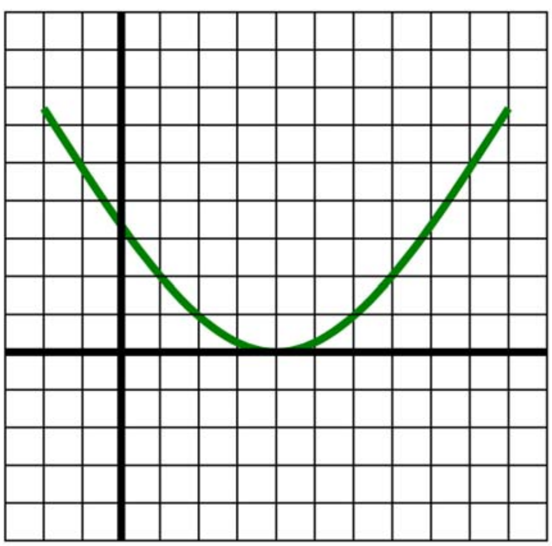


5.3.2: Key Features of Quadratic Relations

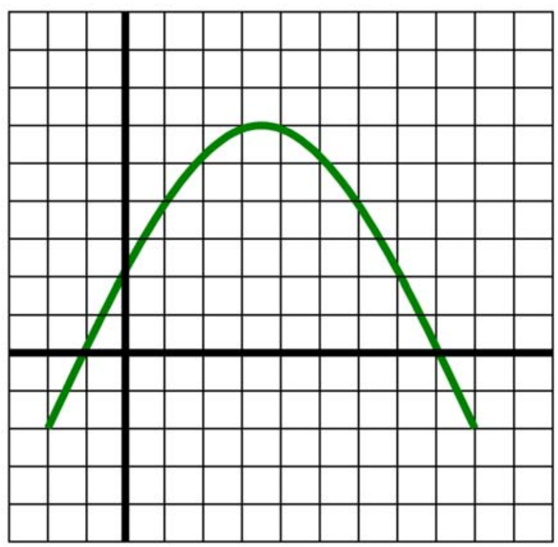
Terminology	Definition	How Do I Label It?	Graph A	Graph B
Vertex	The maximum or minimum point on the graph. It is the point where the graph changes direction.	(x,y)		
Minimum/ maximum value				
Axis of symmetry				
y-intercept				
x-intercepts				
Zeros				

Label the graphs using the correct terminology.

Graph A



Graph B



5.3.3: Key Terminology

Cut out the following boxes and place them in the correct position on the two graphs on the previous page.

Axis of symmetry

vertex

y-intercept

zero

zero

Maximum

value

Minimum

value

5.4.1: Key Features of a Parabola

Write the feature of a parabola that you were given in the centre of the graphic. Complete the chart. Include sketches and graphs with your work.

Definition	**Facts/Characteristics**

Parabola

Examples	**Non-examples**

5.4.2: Quadratic Power – Modelling Canada's Baby Boom

Your Task

The Baby Boom occurred right after World War II. Determine if a parabola can be a useful model for the number of births per year for this post-war Baby Boom period.

Procedure

To access Canada's Baby Boom data

1. Open the E-STAT website at http://estat.statcan.ca.
2. Select your language of choice. Click **Accept and Enter** at the bottom of the screen.
3. Click **Search CANSIM** on the left side bar and then click **Search by Table Number**.
5. In the blank box, type **053-0001** to retrieve Table 053-0001 – Vital statistics, births, deaths, and marriages, quarterly.
5. On the subset selection page choose as follows:
   - Under Geography, select **Canada**
   - Under Estimates, select **Births**
   - Under From, select **Jan. 1950**
   - Under To, select **Dec. 1967**
6. Click the **Retrieve as Individual Time Series** button.
7. In the Output specification screen under output format selection, click the **down arrow** and select **Plain Text Table, Time as Rows**.
8. From "The frequency of the output data will be" pull-down menu, select **Converted to Annual (Sum)**.
9. Press the **Go** button.
10. Record the data on a sheet of paper using the following headings: Year and Births.

Year	Births
1950	372009
1951	381092
1952	403559
1953	417884
1954	436198
1955	442937
1956	450739
1957	469093
1958	470118
1959	479275
1960	478551
1961	475700
1962	469693
1963	465767
1964	452915
1965	418595
1966	387710
1967	370894

Graphing Calculator Analysis

1. Create a Births vs. Year scatter plot on your graphing calculator.
2. Perform a Linear Regression on your graphing calculator. Write the equation of the line.
3. How well does the Linear Regression fit the data?
5. Perform a Quadratic Regression on your graphing calculator. Write the equation of the line.
5. How well does the Quadratic Regression fit the data?
6. Which regression best describes the data?

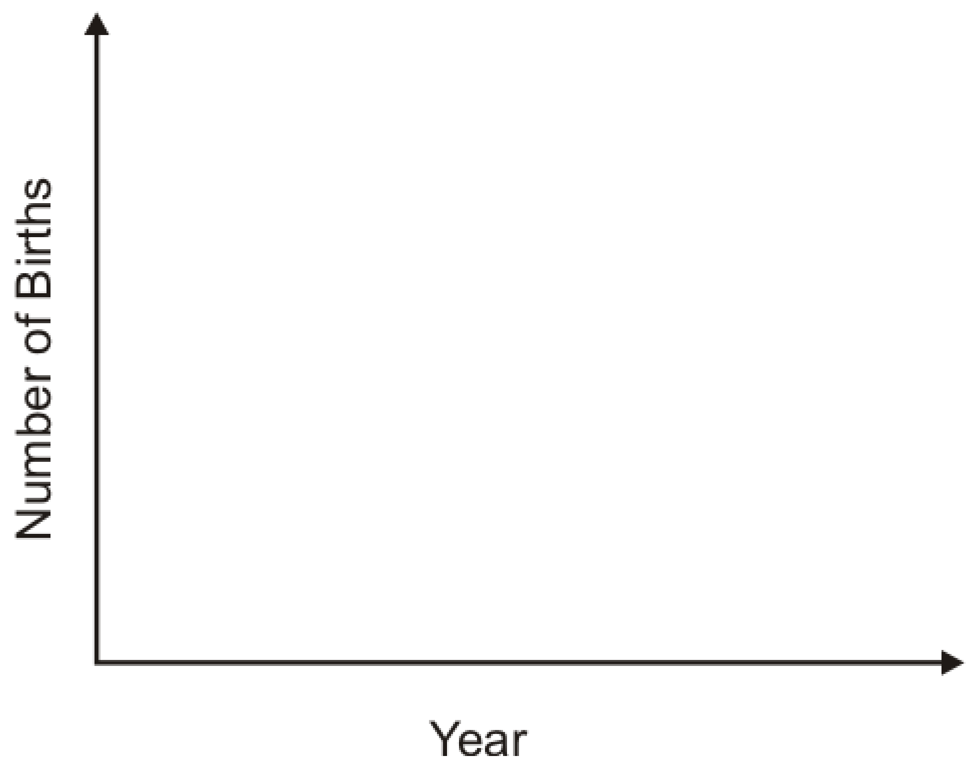
Source:
http://www.keypress.com/fathom/pages/community_exchange/activities_and_documents/activities.php

5.4.3: Modelling Canada's Baby Boom

You examined Baby Boom births in Canada, between 1950–1967.
Sketch what you think the graph of the number of births in Canada between 1950–2005 might look like.

Explain your reasoning and any assumptions you made.

Births in Canada 1950–2005



5.5.1: Ball Bouncing Instructions

Record your hypothesis on the Ball Bouncing Record Sheet.
Use the CBR and the graphing calculator to examine the relationship between the bounce heights of your ball versus time after it is dropped from 1 m.

Instructions to Use Technology

1. Press the APPS button on your calculator and select **CBR/CBL**.
2. Follow the instructions on the calculator screen and press **ENTER**.
3. Run the Ranger program on your calculator.
5. From the main menu of the Ranger Program, select **3:APPLICATIONS**.
5. Select **1:METERS** and then select **3:BALL BOUNCE**.
6. Follow the directions on the screen of your calculator. Release the ball so that the bottom of the ball is 1 m above the floor. The CBR should be at the same height as the bottom of the ball. Drop the ball and then press the trigger key on the CBR just before the ball strikes the ground. Try to keep the CBR steady as it collects the data. This may take a little practice.
7. Your graph should have a minimum of 3 bounces. If you are not satisfied with the results of your experiment, press **ENTER**, select **5:REPEAT SAMPLE**, and try again. Repeat it until you get a nice graph of the ball bouncing.

Data Collection

The goal is to capture the motion of the ball that represents the period from the first bounce to the second bounce.

1. Press **ENTER** to return to the PLOT MENU. Select **7:QUIT** to exit the Ranger Program. The data that you will work with will be in L1 and L2.
2. Use the built-in Select feature of the calculator to select the data you want. Follow the keystrokes below.
   a) Press **2nd [STAT]**, scroll over to OPS menu and then scroll down to #8:SELECT, (and press **ENTER**.
   b) After the bracket (, enter where you want to store the selected data. To use L3 and L4, press **2nd L3 [,] 2nd L4** and **ENTER**.
   c) To actually select a part of the graph you will use, use the arrow keys to move to the left end of the parabola that you want to keep. This should be the first bounce. Press **ENTER**. This sets the left bound. Use the arrow keys to move to the right end of the parabola that you want. This should be the second bounce. Press **ENTER**. The selected data will be placed in L3, L4 and then this data will be displayed.
   d) Sketch a graph of this single parabola using the instructions and grid provided on your Ball Bouncing Record Sheet.
3. Repeat the experiment for each of the different balls.

5.5.2: Ball Bouncing Record Sheet

Hypothesis

1. We hypothesise the shape of the graph that represents the height of the ball over time will be ____

   Sketch the graph. Explain your reasoning.

2. We hypothesise the time in the air between the first and the second bounce will be

   _________________ for each ball.
   (*the same/different*)

   Explain your reasoning.

Data Collection

Follow the steps described on the Ball Bouncing Instructions sheet.
To make a graph of each ball bounce, use the **TRACE** function or the **LIST** found using the **STAT** key **EDIT** from the graphing calculator, to complete the table of values for 7 points, starting at the first bounce and ending with the second bounce. Include the maximum point. Choose an appropriate scale to make an accurate sketch of the graph.

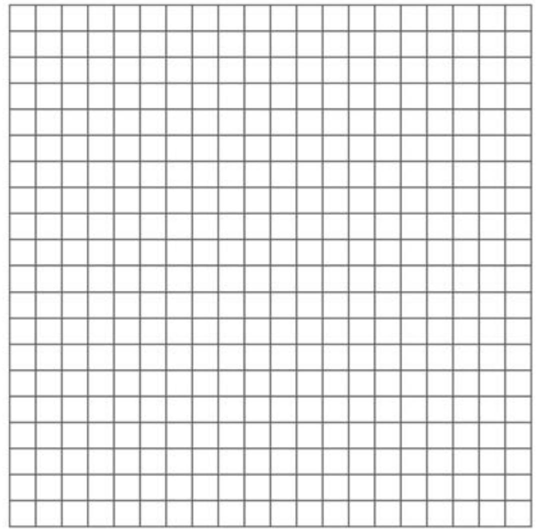
1. Ball type: ____________________

Times (s)	Height (cm)
	0
	(max)
	0

5.5.2: Ball Bouncing Activity (continued)

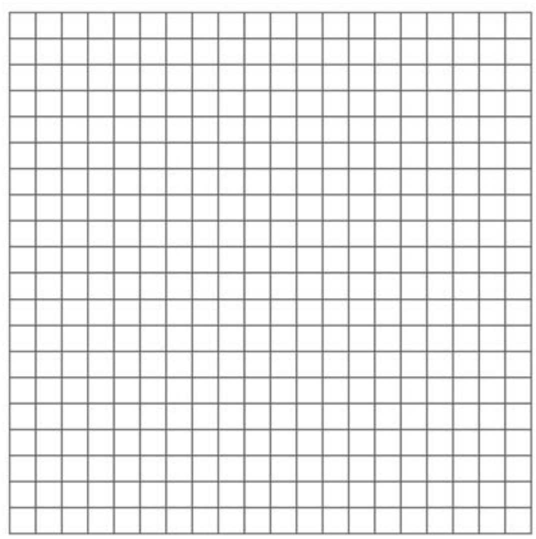
2. Ball type: ___________________

Times (s)	Height (cm)
	0
	(max)
	0



3. Ball type: ___________________

Times (s)	Height (cm)
	0
	(max)
	0



5.W: Definition Page

Term	Picture / Sketch / Examples	Definition
Second Differences		
Parabola		
Vertex		
Maximum/Minimum Value		
Axis of Symmetry		
Zeroes		

5.S: Unit Summary Page

Unit Name: ____

Using a graphic organizer of your choice create a unit summary.

5.R: Reflecting on My Learning (3, 2, 1)

3 Things I know well from this unit
2 Things I need explained more
1 Question I still have

5.RLS: Reflecting on Learning Skills

Students should be aware of the importance that these skills have on your performance. After receiving your marked assessment, answer the following questions. Be honest with yourself. Good Learning Skills will help you now, in other courses and in the future.

- E – Always
- G – Sometimes
- S – Need Improvement
- N – Never

Organization
- E G S N I came prepared for class with all materials
- E G S N My work is submitted on time
- E G S N I keep my notebook organized.

Work Habits
- E G S N I attempt all of my homework
- E G S N I use my class time efficiently
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- E G S N I am on time
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Team Work
- E G S N I am an active participant in pairs/group work
- E G S N I co-operate with others within my group
- E G S N I respect the opinions of others

Initiative
- E G S N I participate in class discussion/lessons
- E G S N When I have difficulty I seek extra help
- E G S N After I resolve my difficulties, I reattempt the problem
- E G S N I review the daily lesson/ideas/concepts

Works Independently
- E G S N I attempt the work on my own
- E G S N I try before seeking help
- E G S N If I have difficulties I ask others but I stay on task
- E G S N I am committed to tasks at hand

Yes No I know all the different ways available in my school, where I can seek extra help.

Yes No I tried my best.

What will I do differently in the next unit to improve?

____

____

____

____

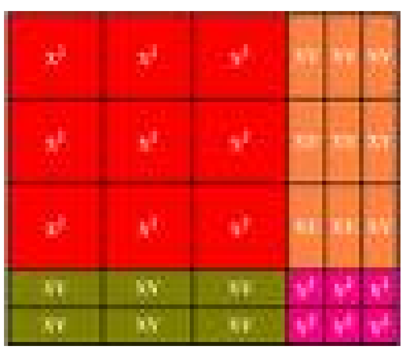
TIPS4RM

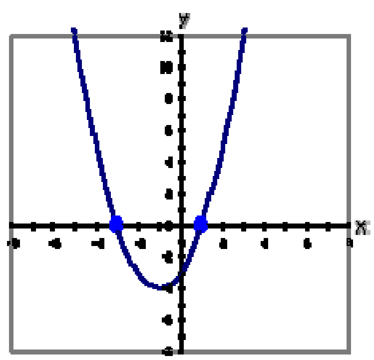
Targeted Implementation and Planning Supports for Revised Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Course: Grade 10 Applied Mathematics (MFM2P)

Unit 6: Quadratic Relations of the Form $y=ax^2 + bx + c$





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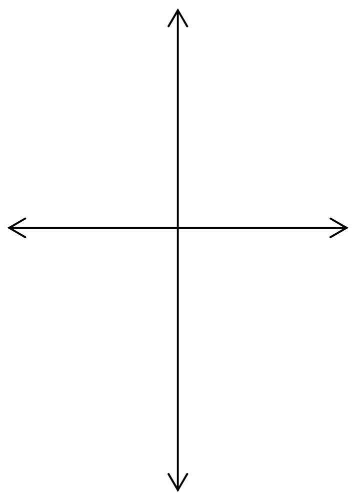
Unit 6
Quadratic Relations of the Form $y=ax^2 + bx + c$

6.1.2: Graphing Quadratic Equations

Name:

1. Obtain a pair of equations from your teacher.
2. Press the **Zoom** button and press **6** (for ZStandard) to set the window to make the max and min on both axes go from –10 to 10.
3. Press the ***y* =** button and key in your two equations into Y_1 and Y_2.
4. To change the graph of Y_2 to "animation": Move the cursor to the left of Y_2. Press **Enter** four times to toggle through different graph styles available.
   You should see
5. Press **Graph**. First the Y_1 quadratic will appear, then the Y_2 quadratic will appear and be traced by an open circle.
6. Complete the three columns of the table below.

Our Two Equations	What They Look Like	What We Think It Means
		

7. Press **2nd Graph** so that you can look at the tables of values for the two curves. Discuss what you see and complete the table.

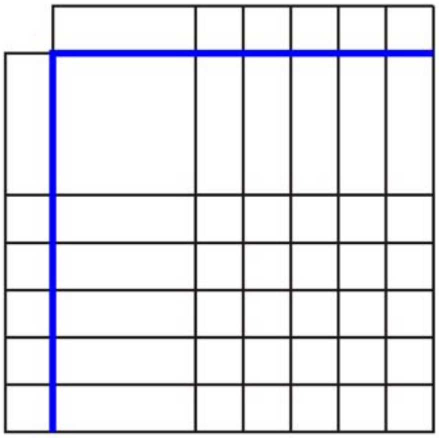
What We Noticed About the Table of Values	What We Think It Means

6.2.1: Multiply a Binomial by a Binomial

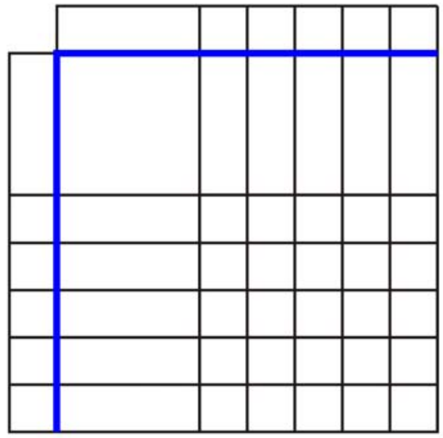
Part A

Use algebra tiles to multiply binomials and simplify the following:

1. $y = (x + 1)(x + 3) =$ ____________________



2. $y = (x + 2)(x + 3) =$ ____________________



Part B

Use the chart method to multiply and simplify the following:

1. $y = (x + 1)(x + 3) =$ ____________________

2. $y = (x + 2)(x +3) =$ ____________________

3. $y = (x + 2)(x - 1) =$ ____________________

4. $y = (x - 2)(x + 3) =$ ____________________

5. $y = (x - 1)(x - 1) =$ ____________________

6. $y = (x - 1) (x - 2) =$ ____________________

6.2.1: Multiply a Binomial by a Binomial (continued)

Part C

Multiply and simplify the two binomials, using the chart method and the distributive property.

1. $(x + 4)(x - 3)$

	x	$+4$
x		
-3		

2. $(x - 3)(x - 3)$

	x	-3
x		
-3		

3. $(x + 2)^2$

	x	$+2$
x		
$+2$		

4. $(x + 2)(x - 1)$

	x	$+2$
x		
-1		

5. $(x - 2)(x + 1)$

	x	-2
x		
$+1$		

6. $(x - 1)^2$

	x	-1
x		
-1		

7. $(x - 1)(x - 2)$

	x	-1
x		
-2		

8. $(x - 3)(x - 4)$

	x	-3
x		
-4		

6.3.1: Finding the *y*-Intercept of a Quadratic Equation

Name:

1. Use the graphing calculator to find the *y*-intercept for each of the equations:

   Note any patterns you see.

Equation	*y*-intercept
$y = x^2 - x - 2$	
$y = x^2 + 2x - 8$	
$y = x^2 - x + 6$	
$y = (x-1)(x-2)$	
$y = (x+4)(x+3)$	
$y = (x+3)^2$	

2. How can you determine the *y*-intercept by looking at a quadratic equation?

3. Which form of the quadratic equation is easiest to use to determine the *y*-intercept? Explain your choice.

4. Using your conclusion from question 2, state the *y*-intercept of each and check using a graphing calculator.

Equation	*y*-intercept	Does it check?	
		Yes	No
$y = x^2 - 2x - 8$			
$y = x^2 - x - 6$			
$y = x^2 + 3x + 2$			
$y = (x-4)(x-1)$			
$y = (x-2)(x+5)$			

5. Explain the connection between the *y*-intercept and the value of *y* when *x* = 0.

6.3.2: Quadratic Equations

Name:

1. Find the y-intercept for each of the following quadratic equations given in factored form. Write the equations in standard form. Show your work.

a) $y=(x-5)(x+2)$

$=$

$=$

standard form:

y-intercept:

b) $y=(x+4)(x-3)$

$=$

$=$

standard form:

y-intercept:

c) $y=(x-4)^2$

$=$

$=$

standard form:

y-intercept:

d) $y=(x+5)^2$

$=$

$=$

standard form:

y-intercept:

2. Find the y-intercept for each of the following quadratic equations:

a) $y=(x+4)(x+2)$

y-intercept:

b) $y=(x-6)^2$

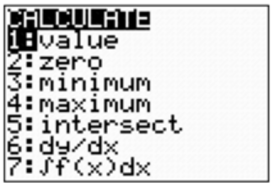
y-intercept:

6.4.1: Finding the *x*-Intercepts of a Quadratic Equation

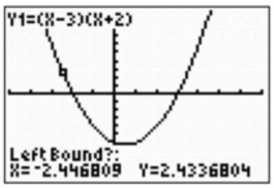
Name:

To find the *x*-intercepts:

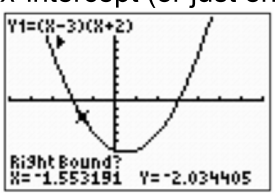
1. Enter the equation in Y_1. $y = x^2 - x - 6$
2. Press **ZOOM** and **6** (Zstandard) to set the scale for your graph. The calculator will then show the parabola.
3. Press **2nd TRACE** 1 to view the Calculate screen.



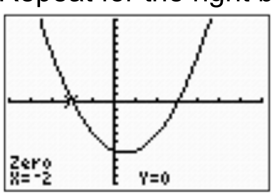
4. Select **2: ZERO**. Your screen should be similar to the following screen.



5. You will be asked to enter a left bound. You can move the cursor to the left of one *x*-intercept (or just enter an *x* value that is to the left of the *x*-intercept). Press **ENTER.**



6. Repeat for the right bound, being sure that you are to the right of the same *x*-intercept.



7. The next screen will say guess. You can guess if you want but it is not necessary. Press ENTER. You will get one *x*-intercept.

8. Repeat steps 3 through 7 to get the other *x*-intercept.

6.4.1: Finding the x-Intercepts of a Quadratic Equation (continued)

1. Use the graphing calculator to find the x-intercepts for each of the following:

Equation	First x-intercept	Second x-intercept
$y = x^2 - 4x - 12$		
$y = x^2 + 2x - 8$		
$y = x^2 - x + 6$		
$y = (x-1)(x-2)$		
$y = (x+4)(x+3)$		
$y = (x-3)(x+5)$		

2. Can you determine the x-intercepts by looking at a quadratic equation? Explain.

3 Which form of the quadratic equation did you find the easiest to use when determining the x-intercepts? Explain the connection between the factors and the x-intercepts.

6.4.2: Area with Algebra Tiles

Name:

Using algebra tiles create the rectangles for the following areas.
Complete the following chart.

Area of Rectangle	Number of x^2 Tiles	Number of x Tiles	Number of Unit Tiles	Sketch of Rectangle	Length	Width
$x^2 + 4x + 3$						
$x^2 + 5x + 6$						
$x^2 + 6x + 8$						
$x^2 + 7x + 12$						

1. Find a relationship between the number of x tiles and the numbers in the expressions for the length and width.

2. Find a relationship between the number of unit tiles and the numbers in the expressions for the length and width.

3. If the area of a rectangle is given by $x^2 + 8x + 15$, what expression will represent the length and the width?

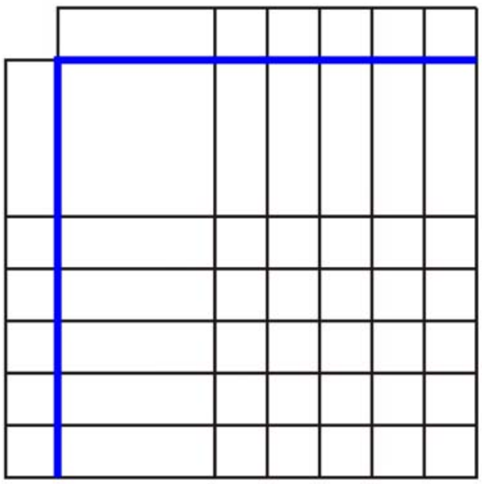
6.4.3: Factoring Using Algebra Tiles and Making Connections to the Graph

Name:

Part A

For each of the following, shade in the appropriate rectangular area. Then shade in the tiles that represent the length and width for each of those areas. Use the length and width to represent and state the factors. State the *x*-intercepts. Check using a graphing calculator.

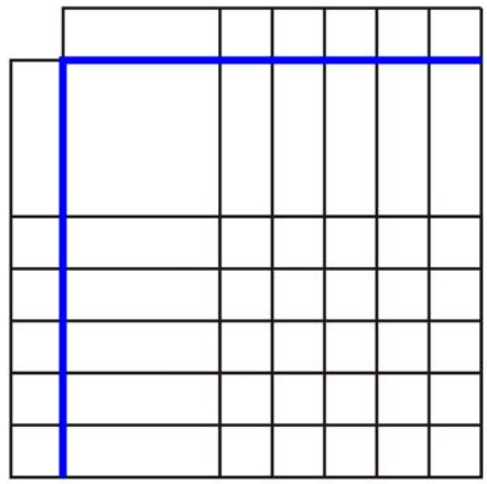
1. $y = x^2 + 3x + 2 = (\quad)(\quad)$



x-intercepts ______, ______

Check with calculator.

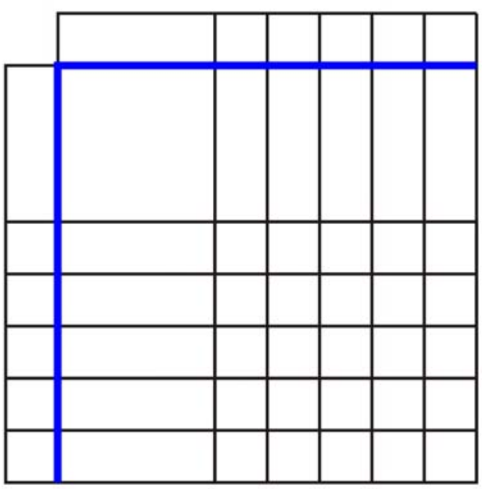
2. $y = x^2 + 5x + 4 = (\quad)(\quad)$



x-intercepts ______, ______

Check with calculator.

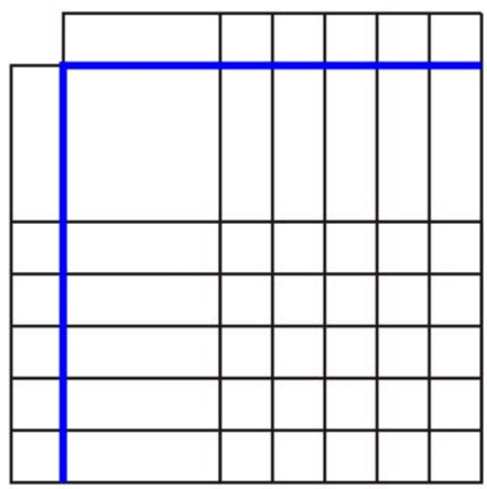
3. $y = x^2 + 6x + 5 = (\quad)(\quad)$



x-intercepts ______, ______

Check with calculator.

4. $y = x^2 + 4x + 4 = (\quad)(\quad)$



x-intercepts ______, ______

Check with calculator.

6.4.3: Factoring Using Algebra Tiles and Making Connections to the Graph (continued)

Part B

Using the diagrams in Part A, find the *x*- and *y*-intercepts for each quadratic relation.
Use the information to make the sketch on the grid provided.

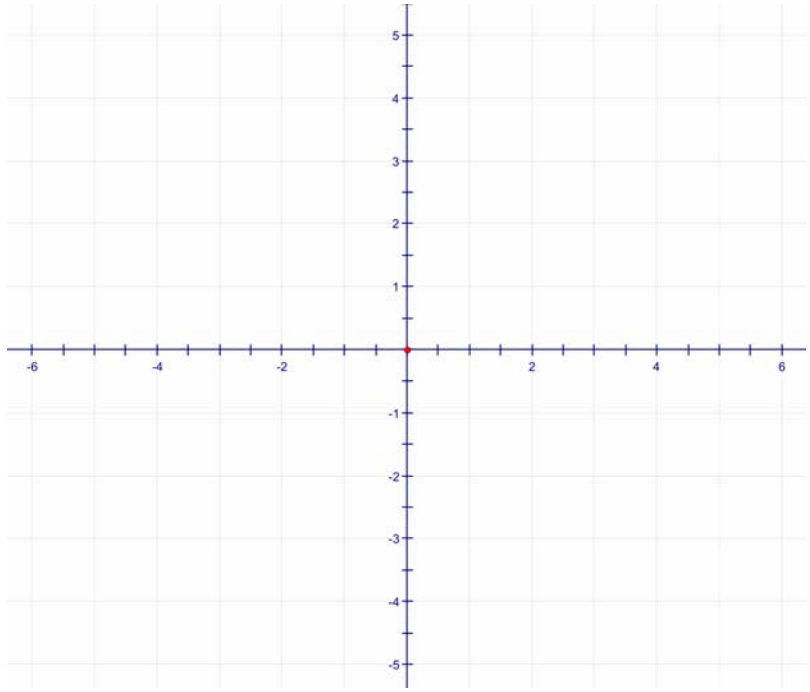
1. standard form:
   $y = x^2 + 3x + 2$

   factored form:

   y-intercept:

   first *x*-intercept:

   second *x*-intercept:



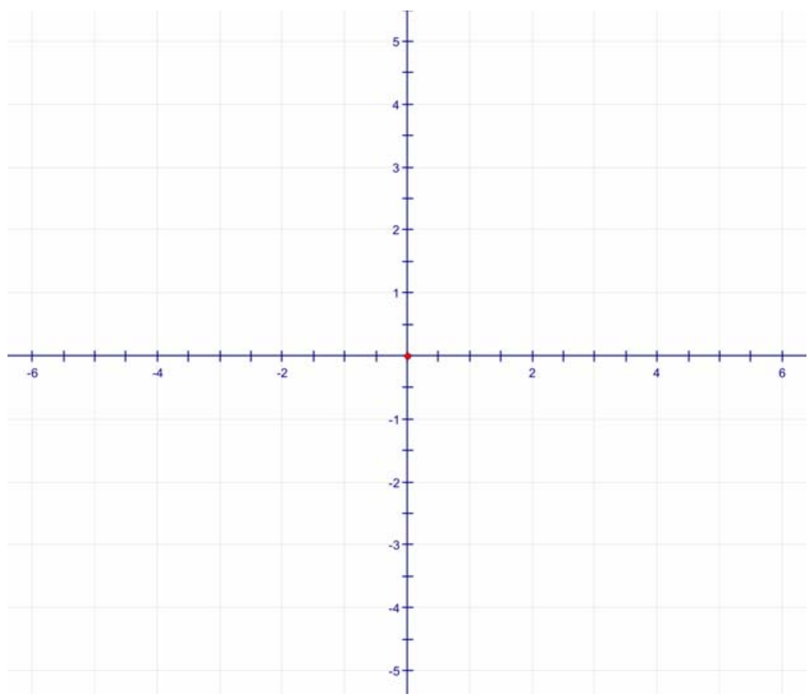
2. standard form:
   $y = x^2 + 5x + 4$

   factored form:

   y-intercept:

   first *x*-intercept:

   second *x*-intercept:



6.4.3: Factoring Using Algebra Tiles and Making Connections to the Graph (continued)

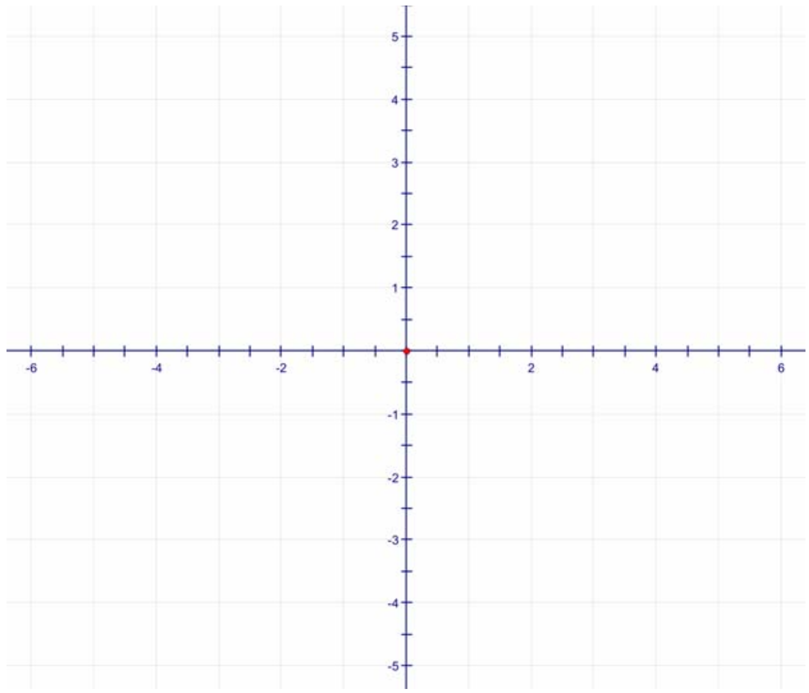
3. standard form:
   $y = x^2 + 6x + 5$

   factored form:

   y-intercept:

   first x-intercept:

   second x-intercept:



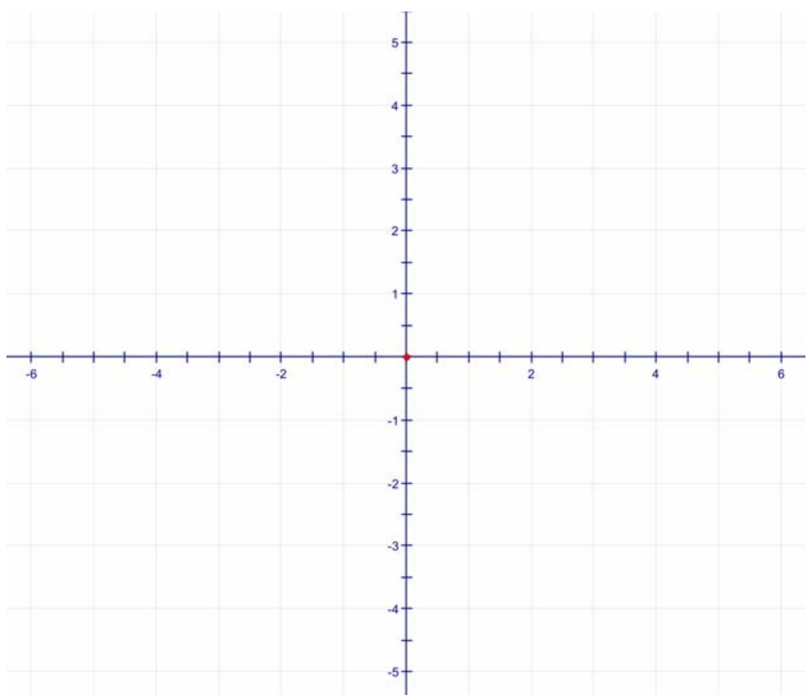
4. standard form:
   $y = x^2 + 4x + 4$

   factored form:

   y-intercept:

   first x-intercept:

   second x-intercept:



5. In what way is the last example different from the others?

6.5.2: Factored Form and *x*-Intercepts

Name:

Use algebra tiles to find the length and width for each given area. Use the graphing calculator to find the *x*-intercepts of the corresponding quadratic relation. Graph both the area model and factored form of the quadratic relation to check that these are the same before finding the *x*-intercepts.

Area	Length	Width	Factored Form	First *x*-intercept of corresponding relation	Second *x*-intercept of corresponding relation
$x^2 + 4x + 3$					
$x^2 + 5x + 6$					
$x^2 + 6x + 8$					
$x^2 + 7x + 12$					

1. What do you notice about the constant term in the length and width expressions and the coefficient of the *x* term in the area expressions?

2. What do you notice about the constant term in the length and width expressions and the constant term in the area expressions?

3. If an area is expressed as $x^2 + 10x + 21$, what must be true of the constant terms in the length and width expressions?

4. If the standard form of a quadratic relation is $y = x^2 + bx + c$, and it has *x*-intercepts of *r* and *s*, then the same relation would then be $y = (x - r)(x - s)$. How would you find the value of *r* and *s*?

6.5.3: Match It!

Name:

Match each pair of numbers on the left with the correct product and sum on the right.

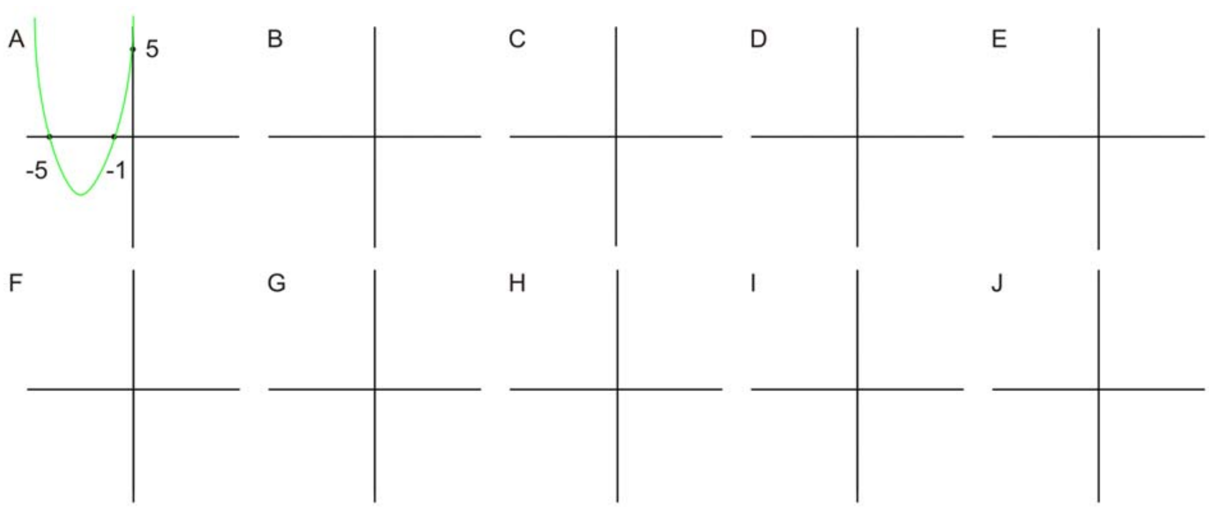
Pair of Numbers		Product and Sum	
1.	$r = -1, s = -5$	a.	$r \times s = 5$ $r + s = 6$
2.	$r = 1, s = 6$	b.	$r \times s = -5$ $r + s = -4$
3.	$r = 2, s = -3$	c.	$r \times s = -5$ $r + s = 4$
4.	$r = 1, s = -5$	d.	$r \times s = 5$ $r + s = -6$
5.	$r = -3, s = 4$	e.	$r \times s = 6$ $r + s = 7$
6.	$r = -1, s = 5$	f.	$r \times s = 6$ $r + s = -7$
7.	$r = -6, s = 2$	g.	$r \times s = -6$ $r + s = -1$
8.	$r = 1, s = 5$	h.	$r \times s = 12$ $r + s = 13$
9.	$r = -1, s = -6$	i.	$r \times s = -12$ $r + s = -4$
10.	$r = 1, s = 12$	j.	$r \times s = -12$ $r + s = 1$

6.6.1: Use Intercepts to Graph It!

Given the standard form of the quadratic relation, identify the value of the sum and product needed to factor. Express the relation in factored form, identify the *x*-intercepts and *y*-intercept, and use these results to make a sketch of each parabola.

	Standard Form	**Product and Sum**	**Pair of Numbers**	**Factored Form**	***x*-intercepts**	***y*-intercept**
A	$y = x^2 + 6x + 5$	r × s = 5 r + s = 6	$r = 1$, $s = 5$	$y = (x+1)(x+5)$	–1 and –5	5
B	$y = x^2 - 4x - 5$	r × s = –5 r + s = –4				
C	$y = x^2 + 4x - 5$	r × s = –5 r + s = 4				
D	$y = x^2 - 6x + 5$	r × s = 5 r + s = –6				
E	$y = x^2 + 7x + 6$	r × s = 6 r + s = 7				
F	$y = x^2 - 6x + 9$	$r \times s =$ $r + s =$				
G	$y = x^2 - x - 6$	$r \times s =$ $r + s =$				
H	$y = x^2 + 13x + 12$	$r \times s =$ $r + s =$				
I	$y = x^2 - 4x - 12$	$r \times s =$ $r + s =$				
J	$y = x^2 + x - 12$	$r \times s =$ $r + s =$				

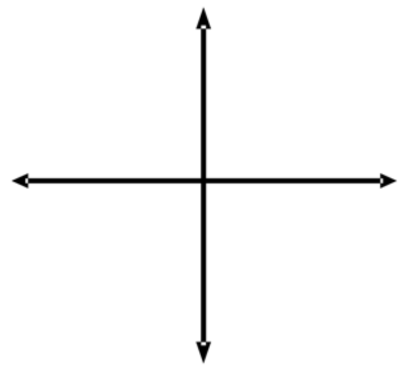
Sketch of the relation



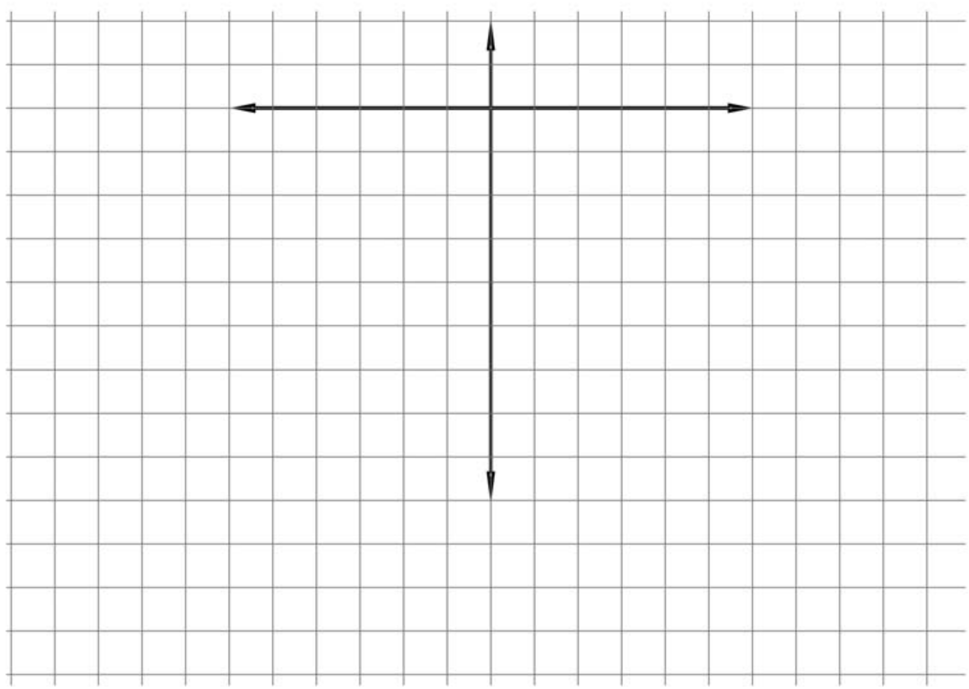
6.7.1: Investigate Relations of the Form $y = ax^2 + b$

Name:

1. Obtain a graphing calculator and equation from your teacher.
2. Type in the equation (using the **Y =** button on your calculator). Key in **zoom 6** to get the max and min from –10 to 10 on your window.
3. Fill in the table.

Your equation	A sketch of your quadratic equation (including the *x*- and *y*-intercepts)
$y =$ Coordinates of *x*-intercepts (______, ______) and (______, ______) and the coordinate of the *y*-intercept (______, ______)	

4. In your group, sketch all four graphs.



5. Identify what is the same and what is different in these four graphs.

6.7.1: Investigate Relations of the Form $y = ax^2 + b$ (continued)

6. Fill in the following table.

Standard form	From the graph, identify the x-intercepts r and s	Write each equation in factored form $y = (x - r)(x - s)$
$y = x^2 + 4x$	$r =$ _____ $s =$ _____	
$y = x^2 + 6x$	$r =$ _____ $s =$ _____	
$y = x^2 - 2x$	$r =$ _____ $s =$ _____	
$y = x^2 - 5x$	$r =$ _____ $s =$ _____	

7. Clear the y = screen on one of the four calculators, enter the factored form of the four equations, and graph. Are these graphs the same as the ones in your sketch? If yes, continue to question 8. If no, revise and check. Ask your teacher for assistance, if needed.

8. Can the equations in the third column of your table be simplified? Explain.

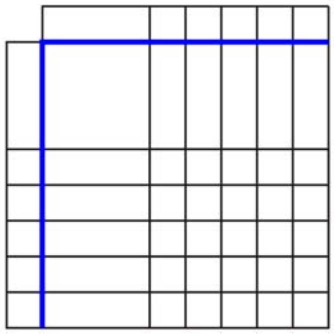
9. Record the simplified versions of your relation in factored form.

Standard Form	Factored Form
$y = x^2 + 4x$	
$y = x^2 + 6x$	
$y = x^2 - 2x$	
$y = x^2 - 5x$	

6.7.2: Factoring $x^2 + bx$

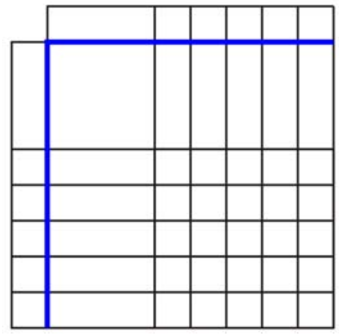
Consider the outer portion of the algebra tile representation as the length and width of a room. The rectangle is the carpet. Colour in as many cells as required for each example to form a rectangle. To factor, form a rectangle using the tiles, then determine the length and width of the room.

Example 1: $x^2 + 2x$



factored form (______) (______)
the coordinates of the x-intercepts of $y = x^2 + 2x$
(______, ______) and (______, ______)
the coordinate of the y-intercept (______, ______)

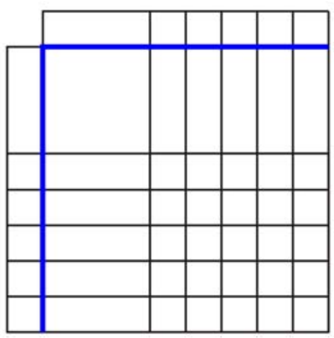
Example 2: $x^2 + 3x$



factored form (______) (______)
the coordinates of the x-intercepts of $y = x^2 + 3x$
(______, ______) and (______, ______)
the coordinate of the y-intercept (______, ______)

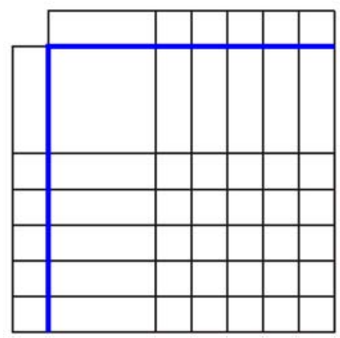
Use your algebra tiles to factor the following:

1. $x^2 + 4x$



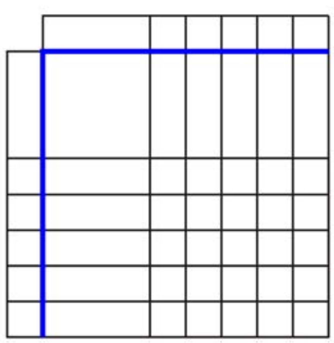
factored form (______) (______)
the coordinates of the x-intercepts of $y = x^2 + 4x$
(______, ______) and (______, ______)
the coordinate of the y-intercept (______, ______)

2. $x^2 + 1x$



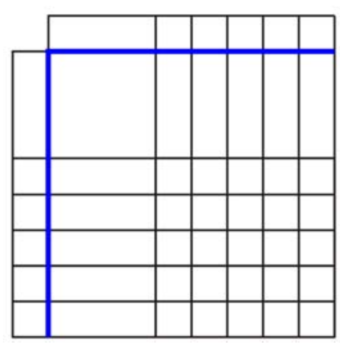
factored form (______) (______)
the coordinates of the x-intercepts of $y = x^2 + 1x$
(______, ______) and (______, ______)
the coordinate of the y-intercept (______, ______)

3. $x^2 + 5x$



factored form (______) (______)
the coordinates of the x-intercepts of $y = x^2 + 5y$
(______, ______) and (______, ______)
the coordinate of the y-intercept (______, ______)

4. $x^2 + x$



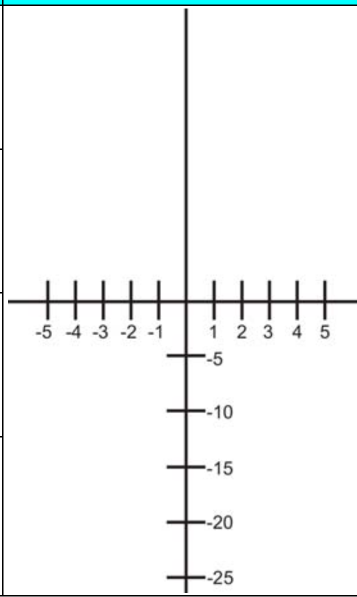
factored form (______) (______)
the coordinates of the x-intercepts of $y = x^2 + x$
(______, ______) and (______, ______)
the coordinate of the y-intercept (______, ______)

6.8.1: Graphing Relations of the Form $y = x^2 - a^2$

Name:

1. Working with a partner and one graphing calculator, set your Window: Xmin = –10; Xmax = 10; Xscl = 1; Ymin = –36; Ymax = 10; Yscl = 1; Xres = 1.

   Complete the following table.

	Relation in standard form	Sketch each graph. Label as A, B, C, D, or use different colours.	y-intercept	x-intercept (r)	x-intercept (s)	Relation in factored form $y = (x - r)(x - s)$
A	$y = x^2 - 4$					
B	$y = x^2 - 9$					
C	$y = x^2 - 16$					
D	$y = x^2 - 25$					

Consider your results from question 1 and answer the following questions.

2. What is the same about the relations?

3. What is the same about the graphs?

4. What is the same about the vertex of each graph?

5. What do you notice about the r and s values of each relation?

6. Solve this puzzle. How can you find the y-intercept and the x-intercepts of the graph of a quadratic relation of the form $y = x^2 - a^2$?

6.9.1 Quick Review of Factoring and Graphing

For each of the following:

- identify what information the equation tells you about the parabola
- factor the equation and identify what the new form of the equation tells you
- sketch the parabola using the information you have (make sure you plot key points!)

Equation (Standard Form)	Y-Intercept	Factored Form	Zeros	Sketched Graph
1. $y = x^2 - 7x + 10$				
2. $y = x^2 - x - 6$				

Equation (Factored Form)	Zeros	Standard Form	Y-Intercept	Sketched Graph
3. $y = (x - 2)(x - 5)$				
4. $y = (x-3)(x+2)$				

6.9.2 Matching

- For each equation in column A, state the y-intercept.
- For each equation in column B, state the zeros (or x-intercepts)
- Each equation in column A has a matching equation in column B. Draw an arrow

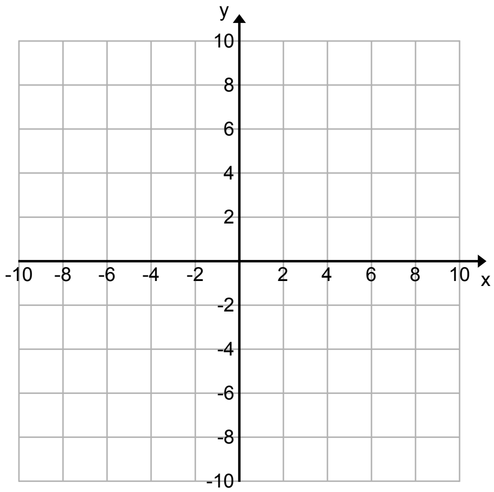
Column A	Column B
$Y = x^2 + 3x + 2$ y-intercept = _______	$Y = (x – 3)(x + 2)$ x-intercepts = _________________
$Y = x^2 – 3x – 10$ y-intercept = _________	$Y = (x – 3)(x – 2)$ x-intercepts = _________________
$Y = x^2 + x – 12$ y-intercept = _________	$Y = (x + 4)(x + 2)$ x-intercepts = _________________
$Y = x^2 – 5x + 6$ y-intercept = __________	$Y = (x + 2)(x + 1)$ x-intercepts = _________________
$Y = x^2 + 6x + 8$ y-intercept = __________	$Y = (x – 3)(x + 4)$ x-intercepts = _________________
$Y = x^2 – 2x – 8$ y-intercept = __________	$Y = (x + 5)(x + 2)$ x-intercepts = _________________
$Y = x^2 + 3x – 4$ y-intercept = __________	$Y = (x – 5)(x + 2)$ x-intercepts = _________________
$Y = x^2 – x – 6$ y-intercept = ___________	$Y = (x – 4)(x + 2)$ x-intercepts = _________________
$Y = x^2 + 7x + 10$ y-intercept = ___________	$Y = (x + 4)(x – 1)$ x-intercepts = _________________

6.9.3 Quick Sketches of Parabolas

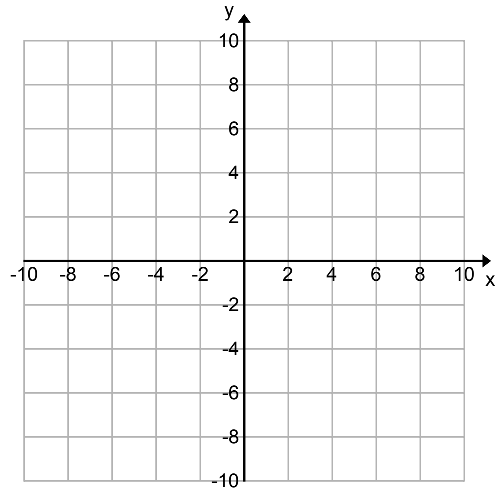
For each quadratic function given below determine:
- The zeros (*x*-intercepts)
- The *y*-intercept

With the information you find and using symmetry, graph each parabola.

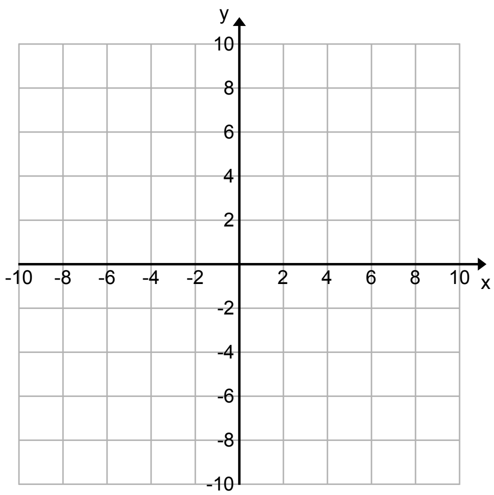
a) $y = x^2 + 6x + 8$



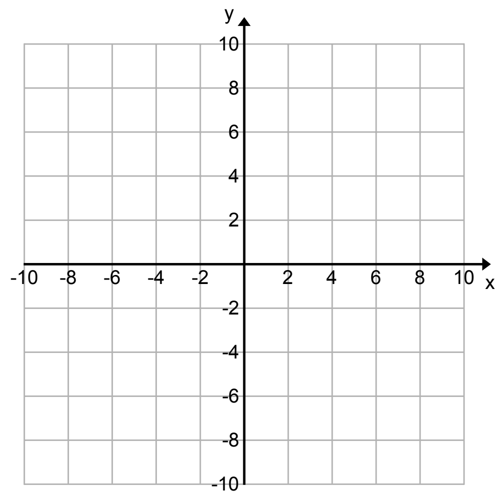
b) $y = x^2 - 7x + 10$



c) $y = x^2 - 3x - 18$

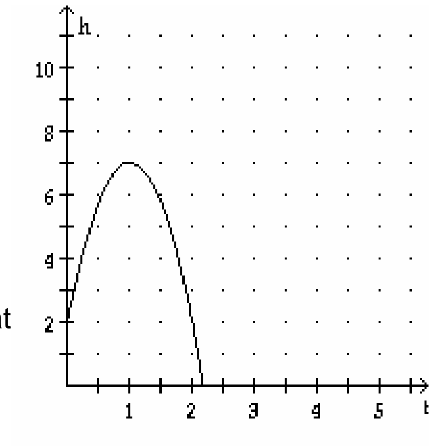


d) $y = x^2 - x - 30$



6.10.1 Problem Solving with Quadratic Graphs-Interpreting Parabolas

1. The graph below shows the height, in meters, of a diver jumping off a springboard versus time, in seconds.

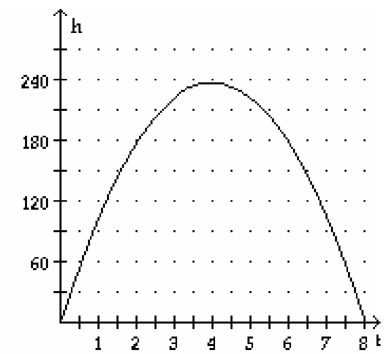


   a) What is the initial height of the jumper? _____
   What is this called in math terminology?

   b) Label and write the ordered pair of the vertex.
   What does this mean in real life?

   c) Label and write the ordered pairs of the roots/zeros. What do these points mean in real life?

2. The graph below shows the height of a toy rocket after it is launched.



   a) How many seconds is the rocket in the air?

   b) What math concept did you use to determine this?

   c) What is the maximum height of the rocket?

   d) At what time does the maximum height occur?

   e) At what times is the rocket 120 meters above the earth?

   f) Complete the table of values below with first and second differences.

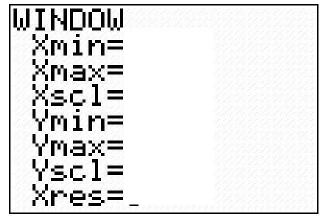
Time	Height	First Diff	Second Diff
0			
1			
2			
3			
4			

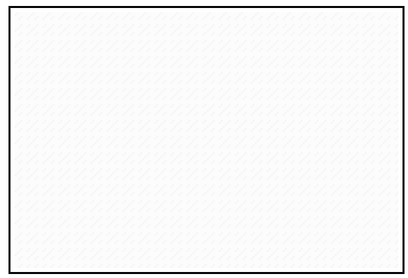
   g) What pattern did you observe in the second differences from the table? How does this prove that the relationship is quadratic?

6.10.2 Applying Quadratic Relationships

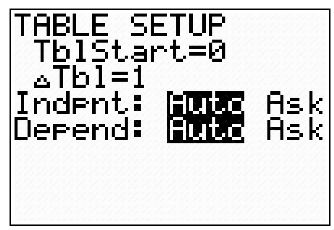
There are many relationships that turn out to be quadratic. One of the most common is the relationship between the height of something (or someone) flying through the air and time.

1. A football player kicks a ball of a football tee. The height of the ball, *h*, in metres after *t* seconds can be modelled using the formula: $h = -5t^2 + 20t$.
   a) Graph the relationship using your graphing calculator. Remember that you need to set your window settings. Record the window settings you used.
   b) Sketch your graph in the window at right. Make sure to label your axes.

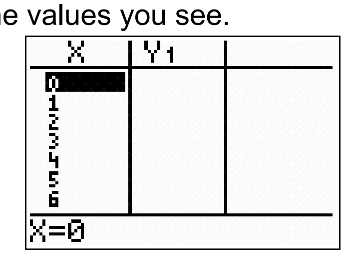




   c) You can get the table of values for this relationship. Press [2nd] and [WINDOW] to access the table setup screen. Make sure your screen looks like the one given.



   d) Now press [2nd] and [GRAPH]. Fill in the window with the values you see.



   e) For which times does the height not make sense? Why?

   f) What is the initial height of the ball? ___________

   g) Where do you look in the table and the graph to determine the answer?

   h) Why does this make sense?

6.10.2 Applying Quadratic Relationships (continued)

i) What is the maximum height of the ball? ___________

j) Where do you look in the table and the graph to determine the answer?

k) When does the ball hit the ground? ___________

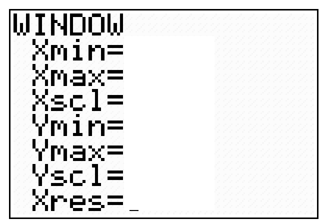
l) Where do you look in the table and the graph to determine the answer?

m) When is the ball more 10 m above the ground? (You may need to give approximate answers.)

Playing Football on Mars

2. The force of gravity on Mars is less than half that on Earth. A ball thrown upward can be modelled using $h = -2t^2 + 15t + 2$ where h is the height in m and t is the time in seconds.

a) Graph the relationship using your graphing calculator. Remember that you need to set your window settings. Record the window settings you used. You may need to play around with the settings until you see the full graph.



b) What is the initial height of the ball? ___________

c) Explain what this means.

d) What is the maximum height of the ball? ___________

e) When does the ball reach its maximum height? ___________

f) When does the ball hit the ground? ___________

g) When is the ball more 20 m above the ground? (You may need to give approximate answers.)

h) If the same ball was thrown upward on the Earth, how would you expect the relationship to change?

i) The force of gravity on Jupiter is much greater than on the Earth. If the same ball was thrown upward on Jupiter, how would you expect the relationship to change?

6.11.1 FRAME (Function Representation And Model Examples)

Algebraic Models	Tables of Values
Visual / Spatial / Concrete	Description / Key words
Contextual	Graphical Model

6.11.2 Review of Quadratics

1. Linear vs Quadratic

a.) A linear relation forms a graph with a ________________.

b.) A quadratic relation forms a graph with shape of a ____________.

c.) Below is a table of value, determine if this relation is linear, quadratic or neither:

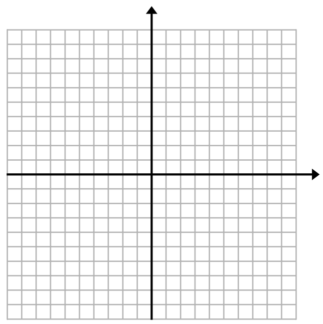
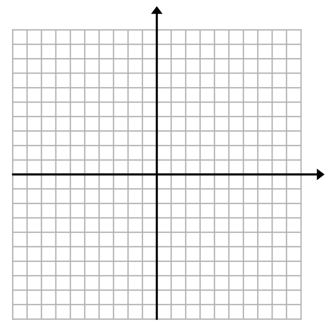
Time (x)	Distance (y)	First Differences	Second Difference

The relation is:

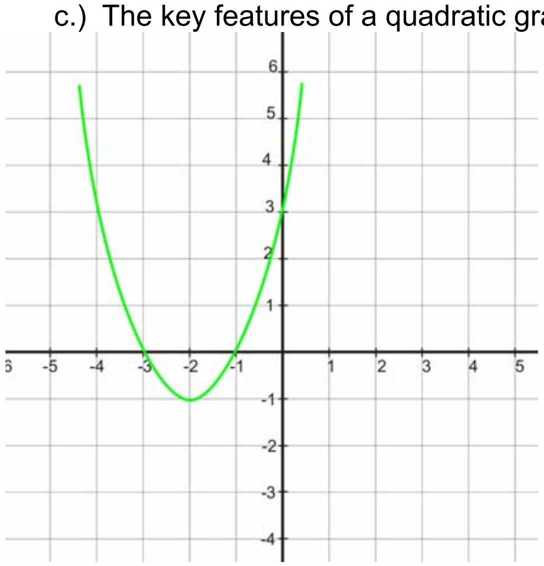
d.) A linear relation has the ________________equal and the ________________ equal to ________________.

e.) A quadratic relation has the __________________ equal.

6.11.2 Review of Quadratics (Continued)

<table>
<tr><th colspan="2">2. Features of a Quadratic Graph</th></tr>
<tr>
<td>a.) A quadratic relation can be seen when a ball is thrown in the air and the height is measured versus time. A sketch of this graph might look:

This parabola is facing ________________
and the vertex is a ______________.</td>
<td>b.) A quadratic relation can be seen when a duck flies into the water, catches a fish and flies back out:

This parabola is facing ________________
and the vertex is a ______________.</td>
</tr>
</table>

c.) The key features of a quadratic graph are:



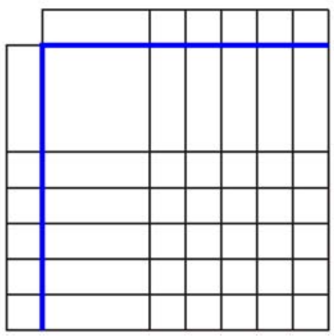
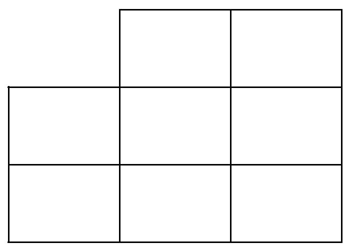
6.11.2 Review of Quadratics (Continued)

3. Forms of A Quadratic - Standard Form: $y = ax^2 + bx + c$

a.) The y-intercept is the _______ or ____ term.
b.) We can change factored into standard form by ________________.
c.) There are three methods of expanding: ________________, _________________, and ___________________

d.) Example 1: Find the y-intercept, x-intercepts of the following quadratic:

$y = (x + 4)(x - 5)$

Method 1: Tiles	Method 2: Table	Method 3: Algebra (FOIL)
		

The y-intercept is: ______________________
The x-intercepts are: _______ and _______________

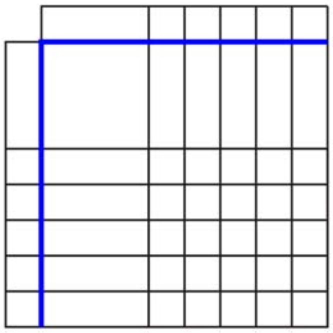
Example 2: Expand the following: **$y = 2x(3x - 4)$**

6.11.2 Review of Quadratics (Continued)

4. Forms of A Quadratic - Factored Form: $y = (x - r)(x - s)$

a.) There are two methods of factoring: algebra tiles and algebra

b.) Example: factor $\mathbf{y = x^2 + 3x + 2}$ using tiles



Product/Sum Form: Factor $y = ax^2 + bx + c$

In this case $r \times s = c$ and $r + s = b$

Find the x-intercepts of the following:

$\mathbf{y = x^2 + 6x + 8}$	$\mathbf{y = x^2 - 3x - 18}$

Common Factoring: $y = ax^2 + bx$

Let us factor: $y = x^2 + 3x$

This can be written as: ____________________________

Based on this $r \times s =$ ________________

$r + s =$ ________________

The factored form is $y =$ __________________________ or ______________________

1. Factor as state the x and y intercepts of:

$\mathbf{y = x^2 + 6x}$	$\mathbf{y = 2x^2 - 2x - 60}$

Difference of Squares: $y = ax^2 - b^2$

2. $y = x^2 - 4$ can be written as $y =$ ______________________________

   $r \times s =$ _______

   $r + s =$ _______ factored form ________________________________

$y = x^2 - 16$	$y = 2x^2 - 200$

6.S: Unit Summary Page

Unit Name: ____

Using a graphic organizer of your choice create a unit summary.

6.R: Reflecting on My Learning (3, 2, 1)

3 Things I know well from this unit
2 Things I need explained more
1 Question I still have

6.RLS: Reflecting on Learning Skills

Students should be aware of the importance that these skills have on your performance. After receiving your marked assessment, answer the following questions. Be honest with yourself. Good Learning Skills will help you now, in other courses and in the future.

- E – Always
- G – Sometimes
- S – Need Improvement
- N – Never

Organization
- E G S N I came prepared for class with all materials
- E G S N My work is submitted on time
- E G S N I keep my notebook organized.

Work Habits
- E G S N I attempt all of my homework
- E G S N I use my class time efficiently
- E G S N I limit my talking to the math topic on hand
- E G S N I am on time
- E G S N If I am away, I ask someone what I missed,
- E G S N I complete the work from the day that I missed.

Team Work
- E G S N I am an active participant in pairs/group work
- E G S N I co-operate with others within my group
- E G S N I respect the opinions of others

Initiative
- E G S N I participate in class discussion/lessons
- E G S N When I have difficulty I seek extra help
- E G S N After I resolve my difficulties, I reattempt the problem
- E G S N I review the daily lesson/ideas/concepts

Works Independently
- E G S N I attempt the work on my own
- E G S N I try before seeking help
- E G S N If I have difficulties I ask others but I stay on task
- E G S N I am committed to tasks at hand

Yes No I know all the different ways available in my school, where I can seek extra help.

Yes No I tried my best.

What will I do differently in the next unit to improve?

____
____
____
____

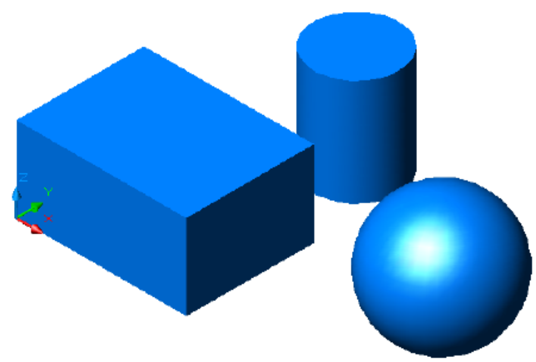
TIPS4RM

Targeted Implementation and Planning Supports for Revised Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Course: Grade 10 Applied Mathematics (MFM2P)

Unit 7: Surface Area and Volume



Dufferin-Peel Catholic District School Board

Student

REVISED

August 2008

Unit 7

Surface Area and Volume

7.1.1: Imperial Measurements

Refer to the many different measuring units on the board at the front of the room. Your job is to take those measurement units and place them in the appropriate column below. **Don't forget to also write the name of an object that could be measured in that unit beside the unit**.

Length	Area	Volume	Mass

7.1.2: Measure This!

In the following table you will see many common school items. Your job is to estimate what you think the measurement of that item will be and then measure the item with the devices that are provided. It's important that you take a really good estimate before you measure. To keep things simple, you can estimate to the closest ½ unit (for example, if you are estimating the length of your arm, you might guess 1 ½ feet, 2 feet or 2 ½ feet).

ITEM	ESTIMATE	ACTUAL
Classroom Door Height	________________ ft.	________________ ft.
Blackboard Height	________________ ft.	________________ ft.
Blackboard Width	________________ yd.	________________ yd.
Textbook Width	________________ in.	________________ in.
Textbook Thickness	________________ in.	________________ in.
Volume of Locker	________________ ft^3.	________________ ft^3.
Height	________________ ft.	________________ ft.
Width	________________ ft.	________________ ft.
Depth	________________ ft.	________________ ft.
Length from your classroom door to the door next door.	________________ yd.	________________ yd.

7.2.1: Imperial Decisions

Fill in the following table by completing the ESTIMATE column first. When you have finished filling in the middle column, the actual conversions will be revealed.

IMPERIAL CONVERSION	ESTIMATE	ACTUAL
Inches to Feet How many inches are in ONE foot?		_______ in. = 1 ft.
Feet to Yards How many feet are in ONE yard?		_______ ft. = 1 yd.
Square inch to Square foot How many square inches are in a square foot?		_______ $in^2 = 1\ ft^2$
Square foot to Square yard How many square feet are in ONE square yard?		_______ $ft^2 = 1\ yd^2$
Cubic inch to Cubic foot How many cubic inches are in ONE cubic foot?		_______ $in^3 = 1\ ft^3$
Cubic foot to Cubic yard How many cubic feet are in ONE cubic yard?		_______ $ft^3 = 1\ yd^3$

7.3.1: Body Parts

INCH — Originally was the length of three barley grains placed end to end. Distance from tip of thumb to first knuckle, or from first to second knuckle on index finger.

My INCH = ____________________ INCHES

FOOT — Length of foot from longest toe to heel

My FOOT = _____________________ INCHES

YARD — Distance from tip of nose to end of thumb with arm outstretched (cloth merchants, King Henry I)

My YARD = _______________________ INCHES

HAND — Width of one hand, including the thumb (height of horses)

My HAND = ________________________ INCHES

CUBIT — Length from point of bent elbow to middle fingertip (Egyptian pyramids, Noah's ark)

My CUBIT = _______________________ INCHES

BRACCIO — Italian for "an arm's length" (Da Vinci's parachute)

My BRACCIO = _______________________INCHES

FATHOM — From the Anglo-Saxon word for "embrace," it was the length of rope held between two hands with the arms outstretched. (sailors)

My FATHOM = ________________________ INCHES

PACE — Length of a single step. In Roman times one pace was a double step, and our MILE came from the Latin mille passuum, meaning 1000 paces.

My PACE = ___________________________ INCHES

7.3.2: A Question of Converting

CONVERSION	ESTIMATE	ACTUAL
Centimetres to Inches How many cm are in ONE inch?	3	______ cm = 1 in.
Centimetres to Inches How many cm are in ONE inch?		______ cm = 1 in.
Decimetre to Feet How many dm are in ONE foot?		______ dm = 1 ft.
Meters to Yards How many meters are in ONE yard?		______ m = 1 yd.
Cubic centimetres to Cubic inches How many cubic cm are in ONE cubic inch?		______ $cm^3 = 1\ in^3$
Meters to Feet How many meters are in ONE foot?		______ m = 1 ft.
Meters to Yards How many meters are in ONE yard?		______ m = 1 yd.
Squared centimetres to Square inches How many squared cm are in ONE square inch?		_______ $cm^2 = 1\ in^2$
Squared meters to Squared feet How many squared meters are in ONE square foot?		_______ $m^2 = 1\ ft^2$
Squared meters to Squared yards How many squared meters are in ONE squared yard?		_______ $m^2 = 1\ yd^2$
Meters cubed to Yards cubed How many cubic meters are in ONE cubic yard?		_______ $m^3 = 1\ yd^3$
Cubic decimetres to Cubic feet How many cubic dm are in ONE cubic foot?		______ $dm^3 = 1\ ft^3$

7.3.3: Convertible Numbers

Let's practice converting some numbers from metric to imperial units (and vice versa).

How many meters are there in 13 yards?

This is a technique called the Ratio Method of converting. It consists of three steps:

1. Set up a ratio in words.
2. Use the conversion table
3. Create equivalent ratio

1. yards : meters

2. 1 : 0.9144

X 13 x 13

3. 13 : ______

0.9144 x 13 = 11.8872

Therefore there are about 11.89 meters in 13 yards.

Let's try another!

How many squared inches are there in 9 squared centimetres?

Ratio → inches^2 : cm^2

Conversion Factor → 1 : 6.45

x 1.395

Equivalent Ratio → ______ : 9

1 x 1.395 = 1.395 in^2

Therefore there are 1.395 in^2 in 9 cm^2.

7.3.3: Convertible Numbers (Continued)

Try the following conversions using your conversion table and the Ratio Method (or any method of your choice).

If you bought a 24 foot ladder, how many meters would it be?	**How many squared feet is a house that measures 42 squared meters?**
If a bag of salt holds 150 cubic inches, how many cubic centimetres does it hold?	**The length of a CFL football field is 160 yards from end-zone to end-zone. How many meters long is the field?**
Joe is 1.75 meters tall. How many feet tall is Joe?	**One can of paint is enough to paint 500 squared feet. How many squared meters can you paint with this one can?**

7.4.1: Placemat: Perimeter and Area

Perimeter

Area

For more information, examples and support on how to administer a placemat activity refer to either of the following resources:

Think Literacy: Cross-Curricular Approaches, Grades 7-10
Small Group Discussions: Place Mat
MATHEMATICS (pgs. 66-71)

http://oame.on.ca/main/files/thinklit/PlaceMat2.pdf

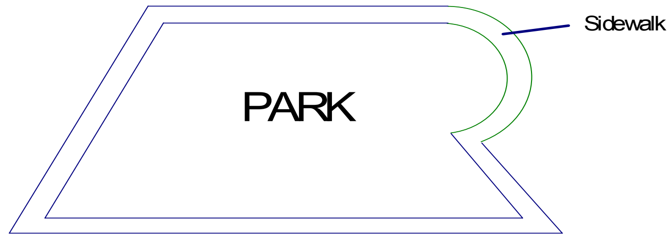
7.4.2: Let's Convert!

Part A: Complete the conversions in the chart below

1 in	________________cm
1 ft	_______________cm
1 ft^2	________________cm^2
1 m (100 cm)	________________in
1 m	________________ft
1 m^2	________________ft^2
1 yds	________________ ft
1 yds^2	________________ ft^2
1 kg	________________lbs
1 kg	________________grams
________________kg	1 lbs
1 ft^3	________________cm^3
1 m^3	________________cm^3
1 m^3	________________ft^3

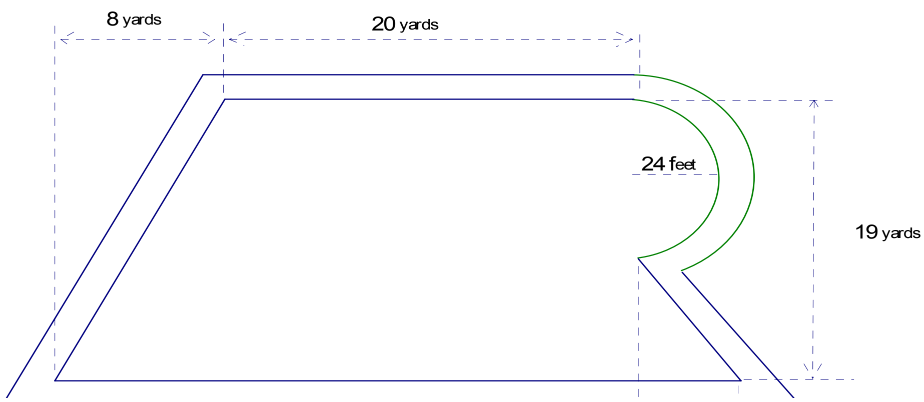
7.4.3: Proposing the Park

Sham City, has asked your landscaping company to submit a proposal estimating the cost of completing the construction of a memorial park. Your company needs to sod the park as well as plant a small hedge along the *inside* of the paved sidewalk that is located around the parks' perimeter.



Project A: The Sod

Below is a sketch of the park with its corresponding dimensions. Note that the uniform paved sidewalk surrounding the green space is 1.5 yards wide.



To determine the amount of sod required, you will need to find the total area of the park. Since you know how to find the areas of basic shapes (e.g. circles, rectangles and triangles), you should try to break up the park into basic shapes and determine the areas of each.

1. Examine the inside area that is to receive sod. Draw line segments that will break up the field into basic shapes (you may have duplicated shapes).

7.4.3: Proposing the Park (Continued)

2. Draw the basic shapes in the space below. Be sure to include the dimensions of each shape. You may or may not use all of the space provided below.

Basic Shape 1:_______________	Basic Shape 2: _______________
Basic Shape 3:________________	Basic Shape 4: ________________

3. Determine the area for each of your basic shapes drawn above, to 1 decimal place.

Area Basic Shape 1:_______________	Area Basic Shape 2: _______________
Area Basic Shape 3:________________	Area Basic Shape 4: ________________

7.4.3: Proposing the Park (Continued)

4. Calculate the total area of the park that will receive sod, to 1 decimal place. State your solution using the following units:

   (i) square feet

   (ii) square meters

5. If each roll of sod covers 16 square feet, how many rolls of sod need to be ordered to complete the job.

6. Sham City must use a special fertilizer for their grass to grow due to their northern climate. This fertilizer comes in 15lb bags that cover 250 m^2 of new laid sod. How many bags of fertilizer will be required to cover the lawn?

Project B: The Hedge

To determine the total amount of hedging needed, we need to calculate the total perimeter of the park. Recall that the small hedges are to be planted along the *inside* of the path

7.4.3: Proposing the Park (Continued)

1. In the spaces below, draw the basic shapes that were found in Part A.

Basic Shape 1:_______________	Basic Shape 2: _______________
Basic Shape 3:________________	Basic Shape 4: ________________

2. Using a different colour pencil, highlight the sides of each shape that will receive hedging.

3. In the spaces below, calculate the length of each coloured side you found in the previous question (Question 2 above).

Perimeter Basic Shape 1:_______________	Perimeter Basic Shape 2: _______________
Perimeter Basic Shape 3:________________	Perimeter Basic Shape 4: ________________

7.4.3: Proposing the Park (Continued)

4. Find the total perimeter of the park that is to receive hedging. State your solution using the following units:

   (i) feet

   (ii) meters

5. If each ‘hedge plant’ takes up 1.5 feet, how many ‘hedge plants’ are needed to surround the park?

Part C: The Cost

The local nursery is selling the exact hedge you have chosen for the park. The sale price for the hedge is $12 per linear meter. Also, the sod price is $2.50 for a roll. If you have to pay 13% tax, what would be the total cost for the sod and hedge?

7.4.4: Proposing the Park - Rubric

Thinking-'Reasoning and Proving'				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Degree of clarity in explanations and justifications in reporting	Explanations and justifications are partially understandable	Explanations and justifications are understandable by me, but would likely be unclear to others	Explanations and justifications are clear for a range of audiences	Explanations and justifications are particularly clear and detailed
Making inferences, conclusions and justifications	Justification of the answer presented has a limited connection to the problem solving process and models presented	Justification of the answer presented has some connection to the problem solving process and models presented	Justification of the answer presented has a direct connection to the problem solving process and models presented	Justification of the answer has a direct connection to the problem solving process and models presented, with evidence of reflection
Application-'Connecting'				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Make connections among mathematical concepts and procedures	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections
Relate mathematical ideas to situations drawn from other contexts	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections
Communication-'Communicating'				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Ability to read and interpret mathematical language, charts, and graphs	Misinterprets a major part of the information, but carries on to make some otherwise reasonable statements	Misinterprets part of the information, but carries on to make some otherwise reasonable statements	Correctly interprets the information, and makes reasonable statements	Correctly interprets the information, and makes subtle or insightful statements
Correct use of mathematical symbols, labels, units and conventions	Sometimes uses mathematical symbols, labels and conventions correctly	Usually uses mathematical symbols, labels and conventions correctly	Consistently uses mathematical symbols, labels and conventions correctly	Consistently and meticulously uses mathematical symbols, labels and conventions, recognizing novel opportunities for their use
Appropriate use of mathematical vocabulary	Sometimes uses mathematical vocabulary correctly when expected	Usually uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly, recognizing novel opportunities for its use

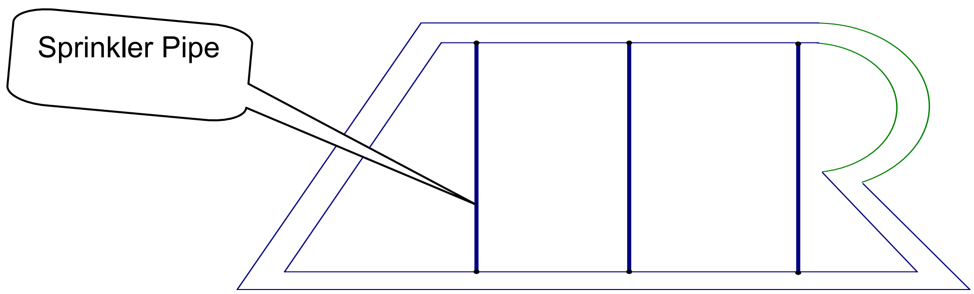
7.5.1: Job Opportunity

Your proposal for the memorial park in Sham City has been carefully reviewed. They were so impressed with the plan that they have decided to also have you install an irrigation system throughout the park. They need a cost proposal from you to see if they can afford this ‘drip’ and ‘soaker’ system in addition to the cost of the sod and hedges.

Note: You will need to refer to your answers from the previous lesson activity for Sham City to complete this cost proposal.

Part A: The SOD

1. There is a by-law in Sham City that states that all city parks must have an underground ‘drip’ sprinkler system. The city gives you the design below that indicates approximately where the plastic underground pipes must go.



a) If pipes come in 5 m lengths, how many pipes need to be purchased for the underground sprinkler system?

b) What will the cost be if each length costs $7.19?

7.5.1: Job Opportunity (Continued)

c) The sod requires plenty of water for optimal growth. The ratio of 1 m^3 of water for every 25 m^2 of sod is needed daily. How many cubic meters of water are required daily for the sod to grow?

d) If it costs the city \$0.03/ft^3 of water, how much will it cost to water the park daily?

Part B: The Hedge

1. To make sure the hedge receives enough water, the city needs to place an underground irrigation system that is made specifically for hedges, called a 'soaker line'. Its price is \$1.83 per linear meter. Determine the cost of the irrigation system for the hedge.

Part C: The Proposal

Complete a proposal to Sham City. Your proposal should be one paragraph. Be sure to include the following:

- The amount of sod and hedging needed in metric units
- The cost of the sod and hedging.
- The cost of the entire irrigation system needed for the sod and hedge.
- Summarize the proposal with a total cost.

Included with your proposal paragraph should be a drawing of the park labeled in metric units. This will be handed in to the teacher to be assessed.

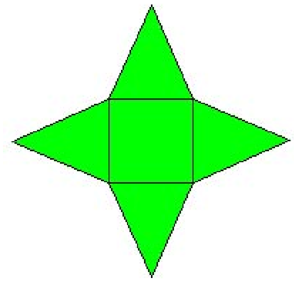
7.5.2: Job Opportunity - Rubric

Thinking-'Reasoning and Proving'				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Degree of clarity in explanations and justifications in reporting	Explanations and justifications are partially understandable	Explanations and justifications are understandable by me, but would likely be unclear to others	Explanations and justifications are clear for a range of audiences	Explanations and justifications are particularly clear and detailed
Making inferences, conclusions and justifications	Justification of the answer presented has a limited connection to the problem solving process and models presented	Justification of the answer presented has some connection to the problem solving process and models presented	Justification of the answer presented has a direct connection to the problem solving process and models presented	Justification of the answer has a direct connection to the problem solving process and models presented, with evidence of reflection
Application-'Connecting'				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Make connections among mathematical concepts and procedures	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections
Relate mathematical ideas to situations drawn from other contexts	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections
Communication-'Communicating'				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Ability to read and interpret mathematical language, charts, and graphs	Misinterprets a major part of the information, but carries on to make some otherwise reasonable statements	Misinterprets part of the information, but carries on to make some otherwise reasonable statements	Correctly interprets the information, and makes reasonable statements	Correctly interprets the information, and makes subtle or insightful statements
Correct use of mathematical symbols, labels, units and conventions	Sometimes uses mathematical symbols, labels and conventions correctly	Usually uses mathematical symbols, labels and conventions correctly	Consistently uses mathematical symbols, labels and conventions correctly	Consistently and meticulously uses mathematical symbols, labels and conventions, recognizing novel opportunities for their use
Appropriate use of mathematical vocabulary	Sometimes uses mathematical vocabulary correctly when expected	Usually uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly, recognizing novel opportunities for its use

7.6.1: Is the NET Up or Down?

Some say the surface area of a **square-based pyramid** is equal to the sum of the areas of a square and four identical triangles. Let's Investigate.

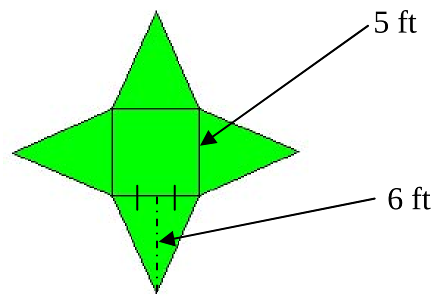
Part A: The NET



1. Examine the following net. Identify & label the square and the 4 identical triangles.

2. To calculate the area of this 2 dimensional net, we need to:
   a. First, find the area of the square, using

$$A_{square} = (length)(width)$$



   b. Second, find the area of one triangle, using

$$Area_{triangle} = \frac{(lendth\,of\ base)(height\,of\ triangle)}{2}$$

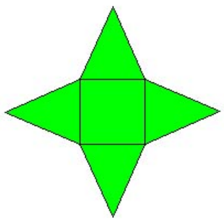
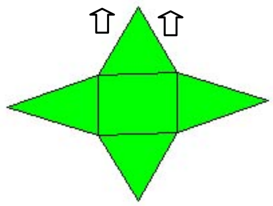
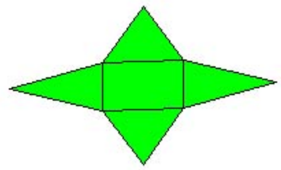
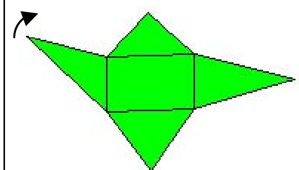
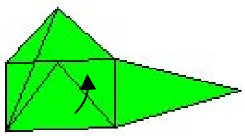
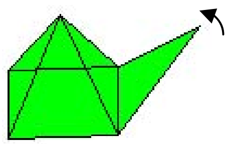
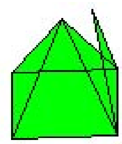
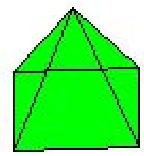
   c. The next step is to multiply the area of the triangle by 4. Explain why you think this step is necessary.
   .

   d. Finally, the total area of the net is the sum of the areas of the square and the triangles. Determine the total area.

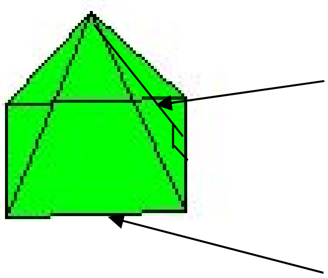
7.6.1: Is the NET Up or Down? (Continued)

Part B: The Folding-Up of the Net!

1. Now we are going to fold the net to create a square-based pyramid. Follow the stages below.

 Stage 1: The NET	 Stage 2: Tilt Back	 Stage 3: Tilt Further back	 Stage 4: The Folding-Up Begins
 Stage 5: Half-Way There!	 Stage 6: Last Triangle	 Stage 7: Almost There!	 Stage 8: Complete!

2. Take the 'stage 8' diagram and locate the measurements from part A on the pyramid.



___ft

This is called the **slant height** of the pyramid, h_s, which bisects the base.

___ft

This is the base of the pyramid, *b*

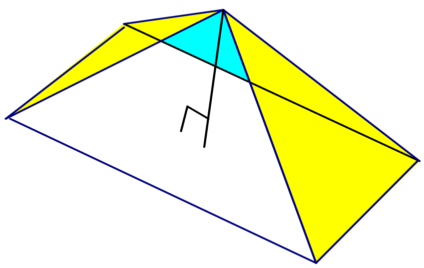
3. Create a formula to find the surface area of any square-based pyramid using '*b*' for the length of the base and 'h_s' for the length of the slant height. Use the equation format below as a guide.

$$\textbf{SA}_{\text{square-based pyramid}} = (\quad)^2 + 4(\qquad)$$

7.6.2: Rectangular-Based Pyramids

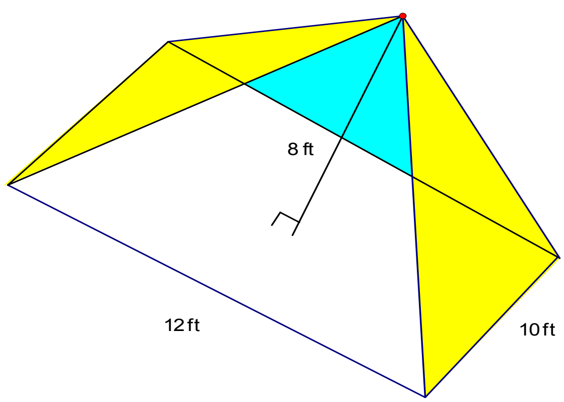
Part A: Rectangular Base Formula

- Identify the slant heights, length and width of the rectangular base.
- Create a formula to calculate the surface area of a rectangular-based pyramid.
- Sketch the net of this rectangular-based pyramid.



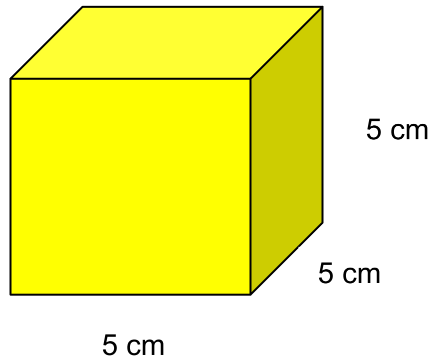
Part B: Rectangular Base Surface Area

- Determine the slant heights of each triangle with the help of the Pythagorean Theorem.
- Calculate the total surface area of the object.

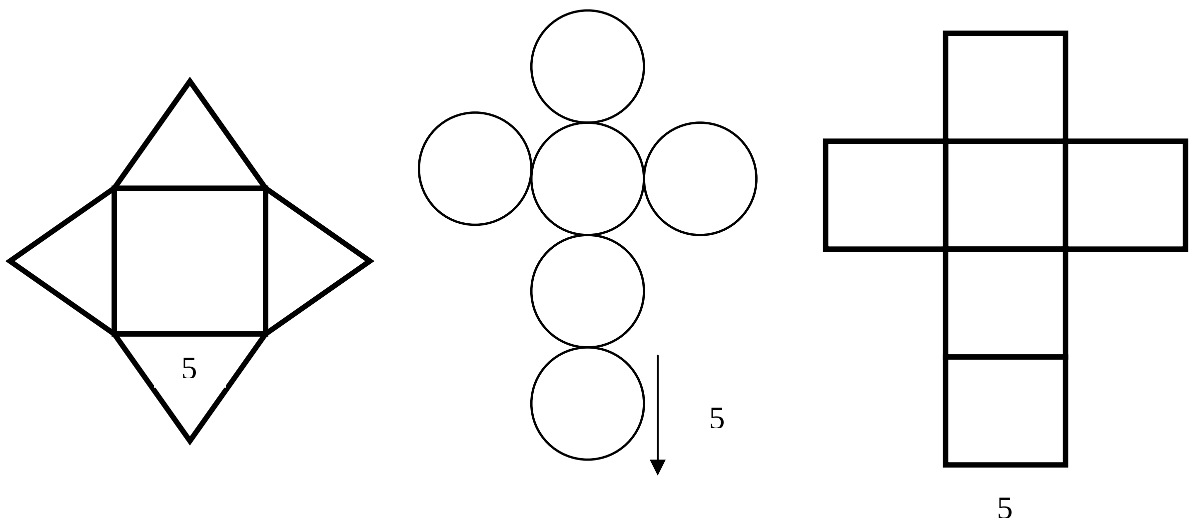


7.7.1: Which Net?

Take a look at the rectangular prism.



a) Which one of the following nets below would create this prism? Circle your choice.



b) Explain how you know that you are right.

c) Find the area of each shape in the net that you selected.

7.7.2: Cuboid Creations

You will be given 27 linking cubes. Your mission is the following.

a) Using all 27 linking cubes, create <u>three *different*</u> rectangular prisms that can be made.

b) Using the isometric dot paper provided, draw each of your creations. Please note that one of your creations will not be able to be drawn because of size limitations.

c) Fill in the following table for your three creations:

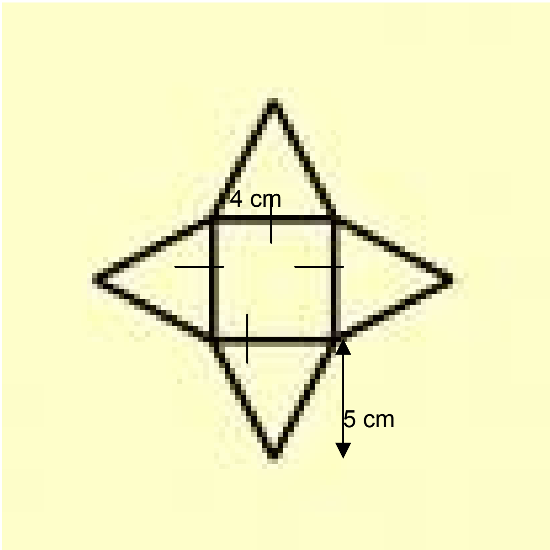
3-D Sketch of prism (with dimensions labelled)	Surface Area (count the squares)	Number of Surfaces	Area of each surface recorded and added up.

d) What do you notice about the 2nd and 4th column?

e) Write your own definition for Surface Area based on what you answered in d).

7.7.3: Net Worth

Take a look at the following net.



Recall that the formula for finding the area of a triangle is:
$A = (b \times h) \div 2$

a) Number the shapes in the above net from 1 to 5.

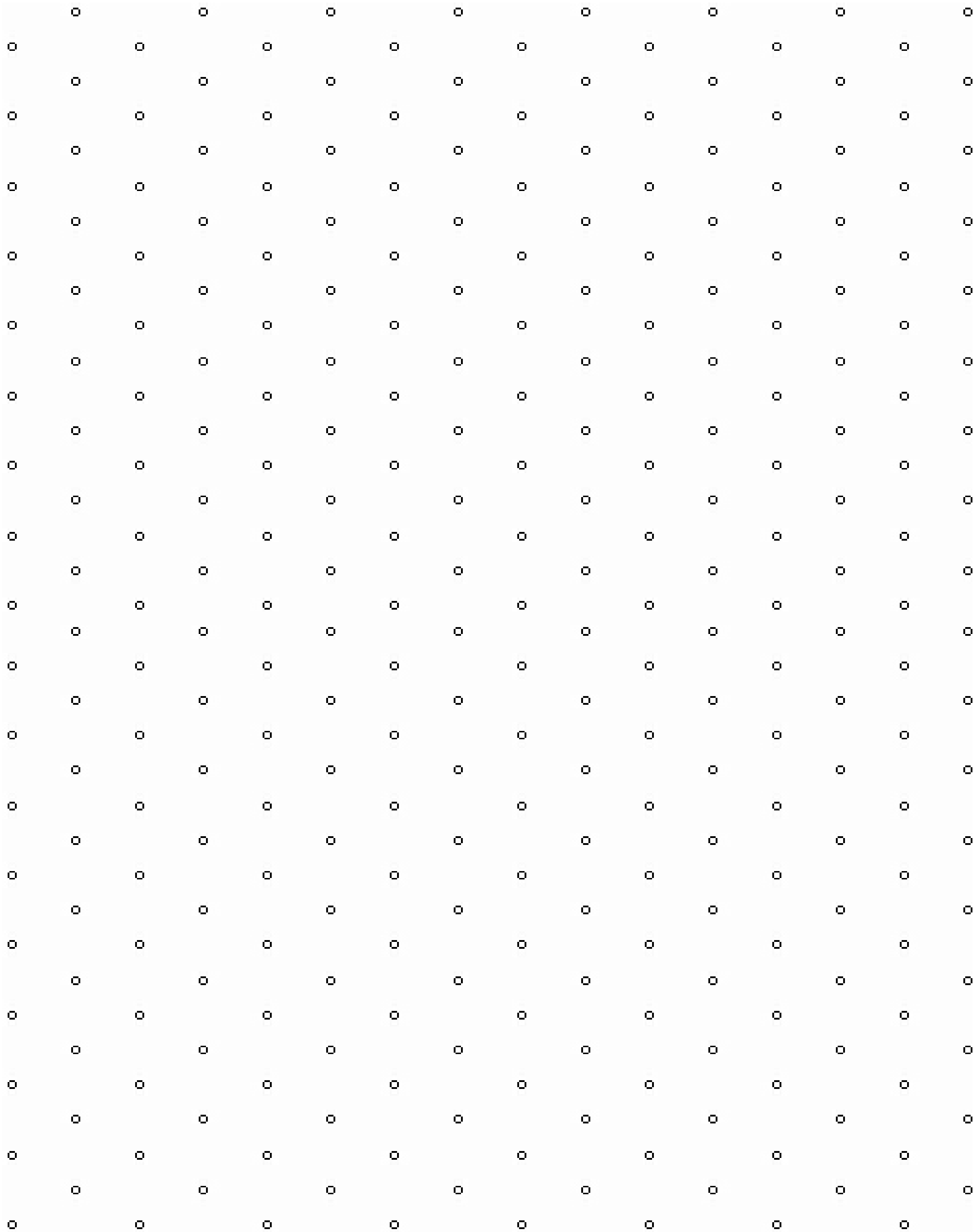
b) Using the chart below, calculate the area of each shape in the above net.

Shape	Area Calculations
1	
2	
3	
4	
5	

c) What 3-D shape would be formed by this net?

d) What would the surface area of this 3-D shape be?

7.7.4: Isometric Dot Paper



7.8.1: Pick a Square, Any Square

On the board, you should see many different sized squares labelled with a unit.

For each of the items in the chart below, select the square unit that you think would be best for describing the *size* of the item. Once you have selected the square unit, make an estimate as to how many squares you think could fit inside the item.

Item	Best Square Unit	Estimated Size (Area)
Classroom Floor		
Front of Math Textbook		
Thumbnail		
Blackboard/Interactive White Board		
One Classroom Window		
Classroom Door		
Clock in Class		

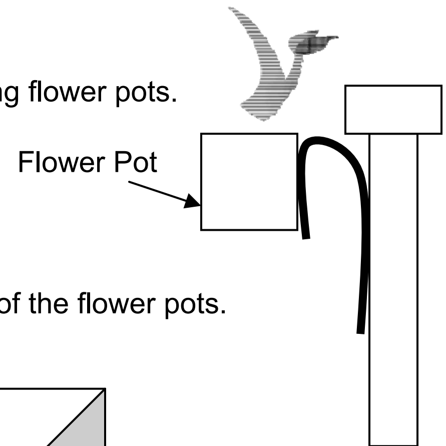
Exchange your chart with a partner when instructed. There is a chart below for your partners' comments.

Partner's Name ____

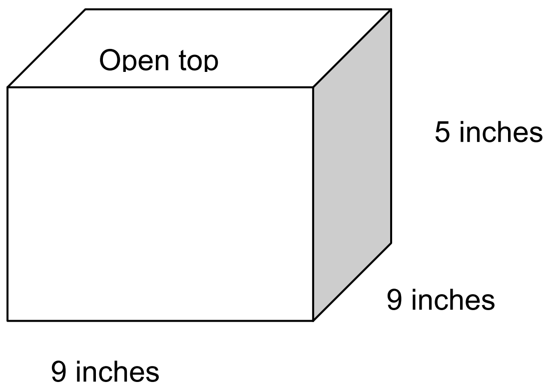
Item	Comments (do you agree with your partners' estimates)
Classroom Floor	
Front of Math Textbook	
Thumbnail	
Blackboard/ Interactive White Board	
One Classroom Window	
Classroom Door	
Clock in Class	

7.8.2: Planter's Dilemma

Joe is going to paint his hanging flower pots.



Here is a close up look at one of the flower pots.



1. How much paint would Joe need (in square inches) to paint the outside of ONE flower pot?

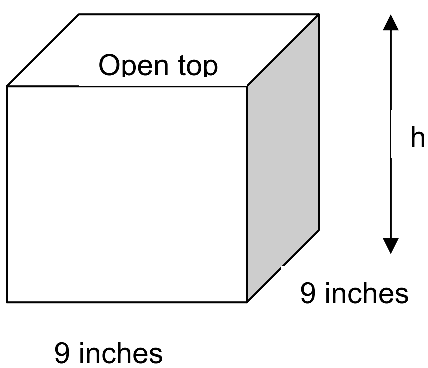
2. How many **square feet** of paint is needed?

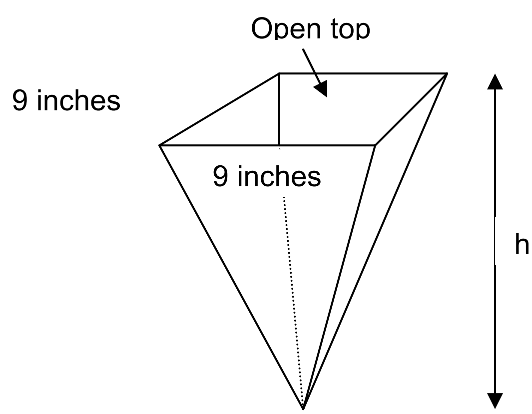
Note: You may need to refer to one of your conversion tables that was made earlier in the unit.

7.8.2: Planter’s Dilemma (Continued)

3. If one quart of paint is enough to paint 10 ft^2, how many quarts will Joe need to buy in order to paint his **10** flower pots?

4. Joe has some other decisions to make about his flower pots. Take a look at two of the other flower pots that Joe could have bought.





What would the height of the each of these two flower pots have to be in order to need exactly TWICE as much paint as one of Joe’s current flower pots?

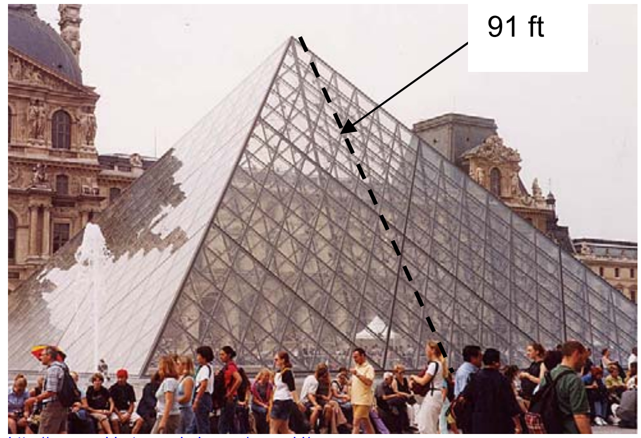
7.8.2: Planter's Dilemma (Continued)

4 (continued).

Square Based Prism	Square Based Pyramid

7.8.3: Applications

1. Find the area of the floor and the amount of glass used to build the latest addition to the entrance of the Louvre, the world-famous museum in Paris, France. Its base measures 116 ft long.



http://www.guide-to-symbols.com/pyramid/

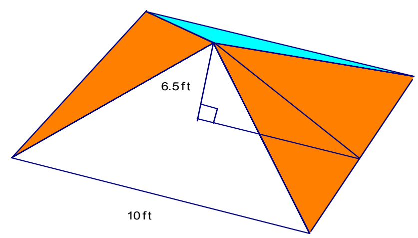
2. A tent that has a square base and a height of 6.5 ft needs a canvas cover.

   a. Identify the base, b and the slant height, h_s.

   b. Is there another calculation you need to complete prior to using the surface area formula for square-based pyramids? Explain.

   c. Calculate the h_s for the tent.

   e. Determine the amount of canvas needed to cover the tent (Hint: The floor of the tent is not made of canvas!).



7.8.4: Planter's Dilemma Rubric

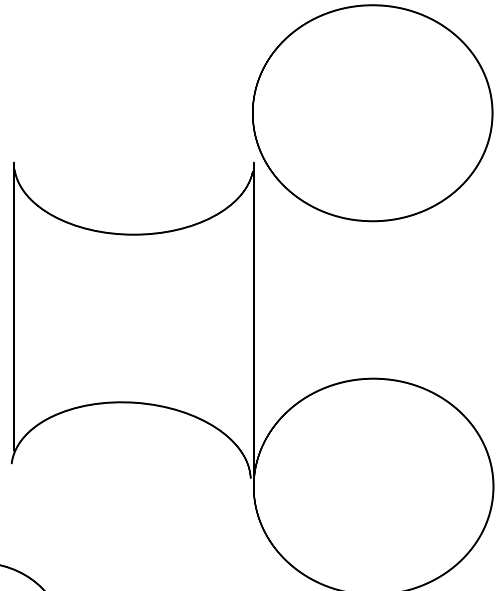
Selecting Computational Strategies				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Select and use strategies to solve a problem	Selects and applies appropriate strategies, with major errors, omissions, or mis-sequencing	Selects and applies appropriate strategies, with minor errors, omissions or mis-sequencing	Selects and applies appropriate strategies, accurately, and logically sequenced	Selects and applies the most appropriate strategies, accurately and logically sequenced
Communicating				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Ability to read and interpret mathematical language, charts, and graphs	Misinterprets a major part of the information, but carries on to make some otherwise reasonable statements	Misinterprets part of the information, but carries on to make some otherwise reasonable statements	Correctly interprets the information, and makes reasonable statements	Correctly interprets the information, and makes subtle or insightful statements
Correct use of mathematical symbols, labels, units and conventions	Sometimes uses mathematical symbols, labels and conventions correctly	Usually uses mathematical symbols, labels and conventions correctly	Consistently uses mathematical symbols, labels and conventions correctly	Consistently and meticulously uses mathematical symbols, labels and conventions, recognizing novel opportunities for their use
Appropriate use of mathematical vocabulary	Sometimes uses mathematical vocabulary correctly when expected	Usually uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly, recognizing novel opportunities for its use
Integration of narrative and mathematical forms of communication	Either mathematical or narrative form is present, but not both	Both mathematical and narrative forms are present, but the forms are not integrated	Both mathematical and narrative forms are present and integrated	A variety of mathematical forms and narrative are present, integrated and well chosen
Connecting				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Make connections among mathematical concepts and procedures	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections
Relate mathematical ideas to situations drawn from other contexts	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections

7.9.1: Cylinder Nets

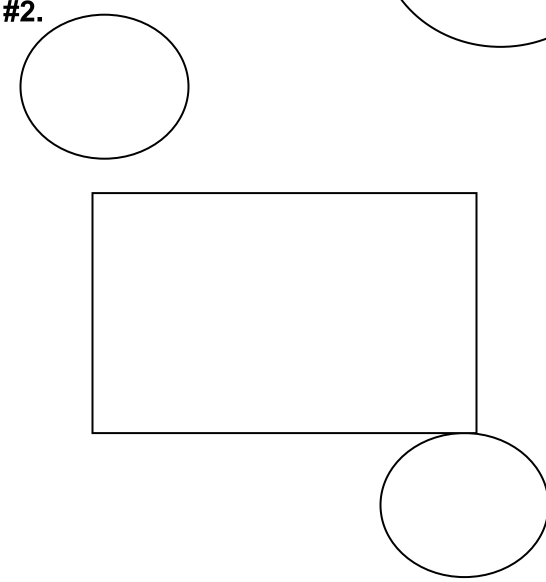
Your Challenge:

Take a look at the three drawings below. Only one of them can be cut out and turned into a cylinder. Select the one that you think will form the cylinder. Cut it out to see if you made the right choice. If you did, you should be able to assemble a cylinder.

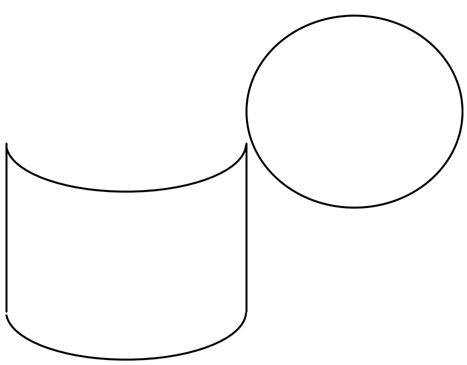
Option #1.



Option #2.



Option #3.



7.9.2: Constructing Cylinders

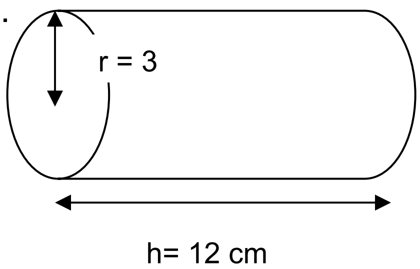
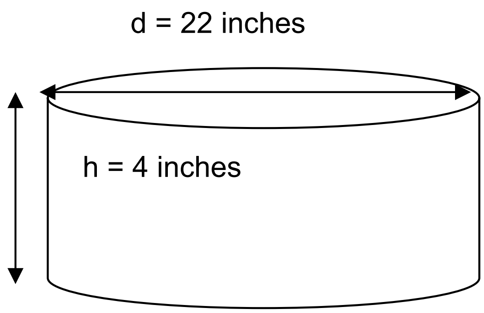
Use the following table to keep track of different cylinders you attempt to construct using Geometer's Sketchpad. Once you get one that works, circle it, cut it out and see if it makes a cylinder.

#	Radius of the Circle on top	Circumference of the Circle $C=2\pi r$	Area of Both Circles Combined $A = \pi r^2$	Dimensions of the Rectangle	Area of the Rectangle $A = l \times w$	Total Area of the Cylinder
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

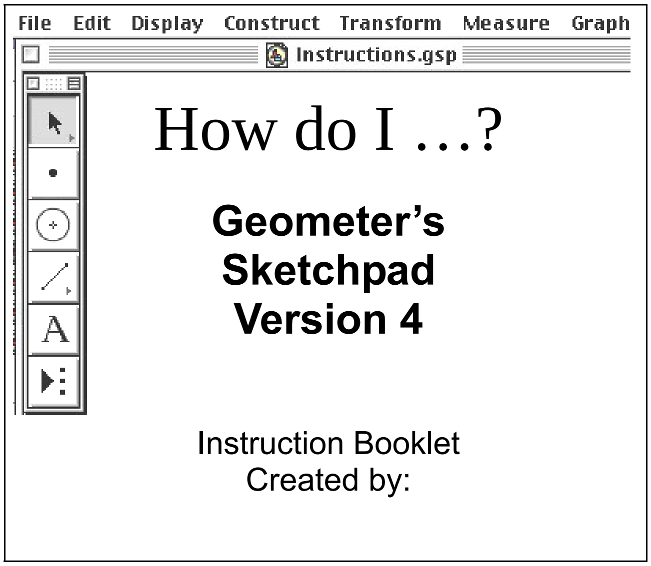
Describe any strategies that you used.

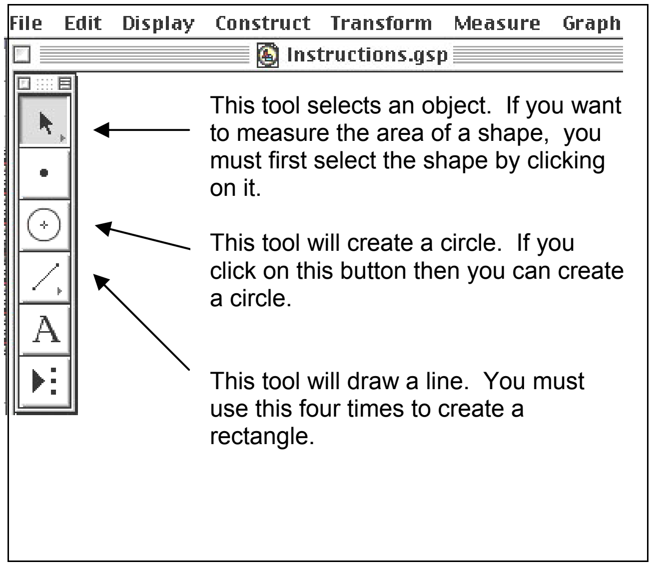
7.9.3: Cylinder Surfaces

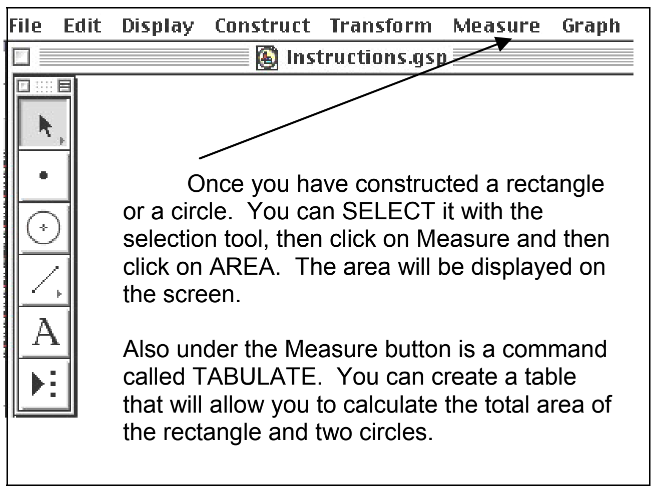
Below you will find two cylinders. You need to calculate their total surface areas.

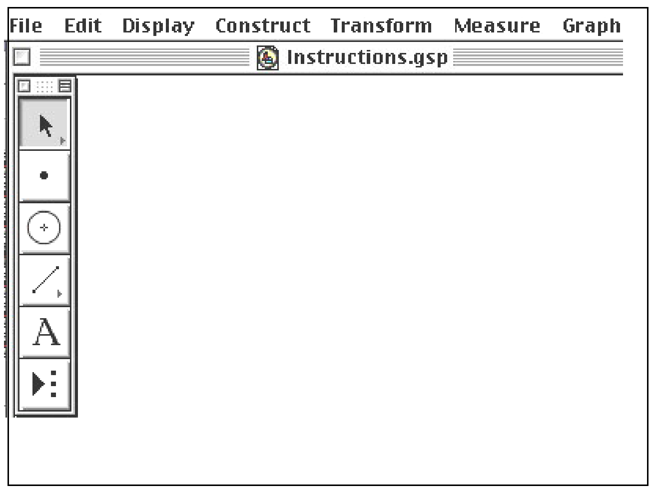
1. 	2. 

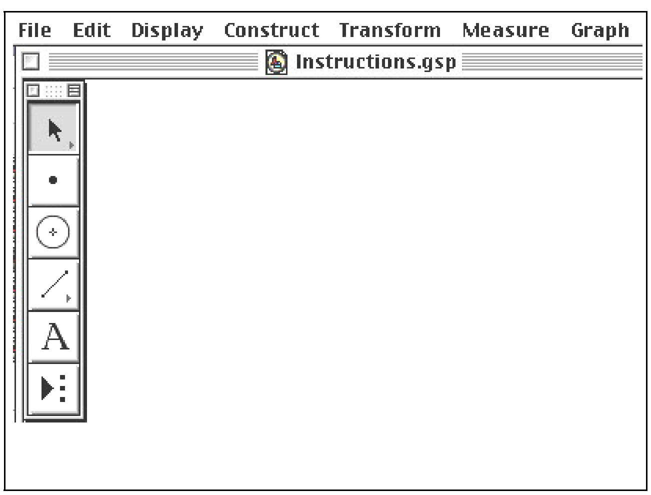
7.9.4: GSP Instructions for Students

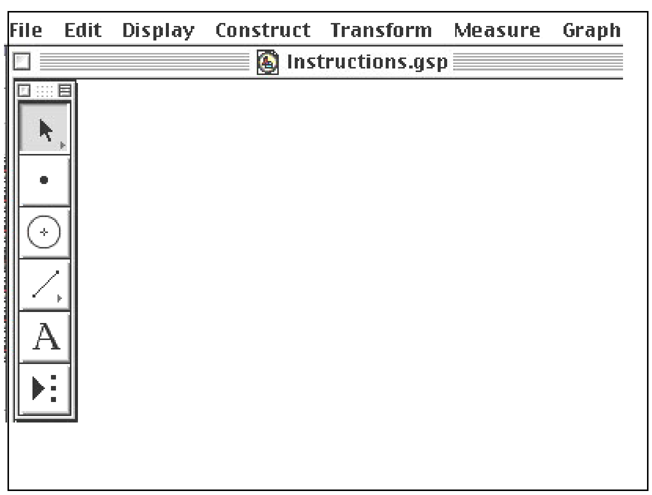










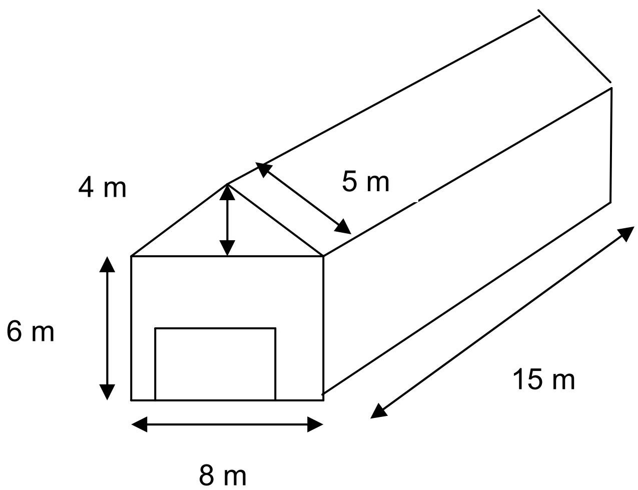


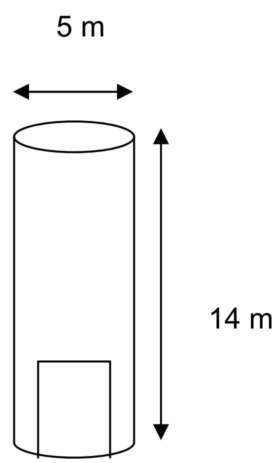
7.10.1: Old McDonald

Old McDonald wants to paint his barn-house and silo. The entire barn-house and silo will be painted red, EXCEPT for the two doors – those will be painted white. Be aware that it is not possible to paint the bottom of the barn-house and silo.

Note: A silo is a structure for storing bulk materials such as grain, coal, cement, carbon black, wood chips, food products and sawdust.

Here is what the barn-house and silo looks like:





The door of the barn-house has dimensions of 5 m wide by 4 m tall.

The door of the silo has dimensions of 3 m wide by 5 m tall.

1. a) What is the area of the **barn-house door** that will be painted white?

b) What is the area of the **barn-house** that will be painted red?

7.10.1: Old McDonald (Continued)

2. a) What is the area of the **silo door** that needs to be painted white?

   b) What is the area of the **silo** that will be painted red?

3. a) What is the **total** surface area that will be painted red?

   b) What is the **total** surface area that will be painted white?

4. a) What would the answer to 3a) be in squared feet?

   b) What would the answer to 3b) be in squared feet?

7.10.1: Old McDonald (Continued)

5. If one can of paint will cover a total of 1000 ft^2:
   (a) How many cans of white paint will Old McDonald need to buy?

   (b) How many cans of red paint will Old McDonald need to buy?

   (c) How many paint cans will Old McDonald need to buy in total?

7.10.2: Old McDonald - Rubric

Selecting Computational Strategies				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Select and use strategies to solve a problem	Selects and applies appropriate strategies, with major errors, omissions, or mis-sequencing	Selects and applies appropriate strategies, with minor errors, omissions or mis-sequencing	Selects and applies appropriate strategies, accurately, and logically sequenced	Selects and applies the most appropriate strategies, accurately and logically sequenced
Communicating				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
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Appropriate use of mathematical vocabulary	Sometimes uses mathematical vocabulary correctly when expected	Usually uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly when expected	Consistently uses mathematical vocabulary correctly, recognizing novel opportunities for its use
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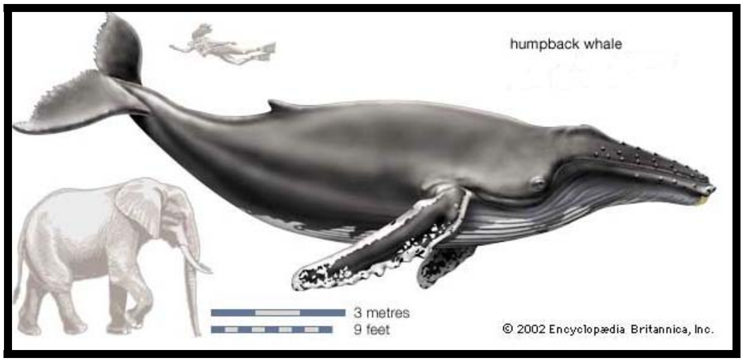
Connecting				
Criteria	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Make connections among mathematical concepts and procedures	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections
Relate mathematical ideas to situations drawn from other contexts	Makes weak connections	Makes simple connections	Makes appropriate connections	Makes strong connections

7.11.1: Count on Frank

One of the facts shared in the book 'Counting on Frank' is that only ten humpback whales would fit in his house. When answering the questions below, use either metric or imperial units.



1. How big is the average humpback whale (estimate)?

2. What type of box can we fit the whale in (e.g. rectangular, triangular, cylindrical or other)?

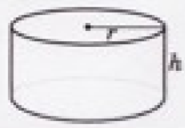
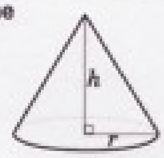
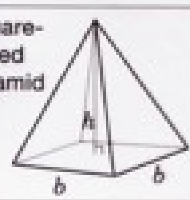
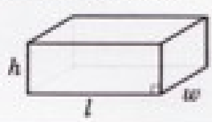
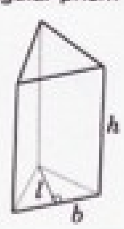
3. What size of box would you need to fit one whale?

4. Determine the dimensions of the box.

5. Imagine ten of these boxes, how much space would that fill?

6. How big is the house?

7.11.2: Formulas to Know!

Geometric Figure	Volume
Cylinder 	$V = (\text{area of base})(\text{height})$ $V = \pi r^2 h$
Sphere 	$V = \frac{4}{3}\pi r^3$ or $V = \frac{4\pi r^3}{3}$
Cone 	$V = \frac{(\text{area of base})(\text{height})}{3}$ $V = \frac{1}{3}\pi r^2 h$ or $V = \frac{\pi r^2 h}{3}$
Square-based pyramid 	$V = \frac{(\text{area of base})(\text{height})}{3}$ $V = \frac{1}{3}b^2 h$ or $V = \frac{b^2 h}{3}$
Rectangular prism 	$V = (\text{area of base})(\text{height})$ $V = lwh$
Triangular prism 	$V = (\text{area of base})(\text{height})$ $V = \frac{1}{2}blh$ or $V = \frac{blh}{2}$

OCTOBER 2007

7.11.3: Shapes to Go!

STATION 1

Part A

Using an Interactive White Board or laptop, you will be investigating the volume of a rectangle.

GETTING STARTED!
(i) Open the website
http://www.learner.org/interactives/geometry/
(ii) Click on the '*Surface Area and Volume'* Tab
(iii) Click on the tab labeled '*Volume: Rectangles'*.

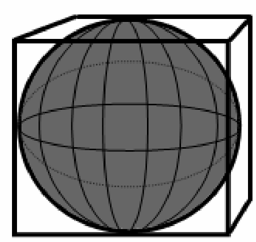
Read through the introduction and then answer the questions provided.

When finished, scroll down and select the 'Find Volume of Another Prism' option.
Fill in the chart provided below.

Prism	# of unit cubes forming the base	Layers needed to fill prism	Volume of prism
1			
2			
3			
4			

Part B

Determine the volume of empty space that is in the box that holds exactly a basketball ball with a diameter of 18 inches.



7.11.3: Shapes to Go! (Continued)

STATION 2

Your goal is to show how the volume of a cone is related to the volume of a cylinder.

Your task:

1. Compare the base of the cone with the base of the cylinder. What do you notice?

2. Compare the height of the cone to the height of the cylinder. What do you notice?

3. How many times do you think you would be able to fill the cone with water and pour it into the cylinder before it overflows? Fill in the blanks below. Fill in the bolded components after you perform the experiment.

Guess: __________ **Actual: ____________**

Therefore, the volume of a cylinder is _____ times greater than the volume of a cone.

LETS TRY IT!

i. Fill the cone full with water.
ii. Empty the water from the cone into the cylinder.
iii. Repeat until the cylinder is completely full (keep track of how many times it takes).

4. From your findings, come up with a formula for the volume of a cone using the volume of a cylinder as a base.

7.11.3: Shapes to Go! (Continued)

STATION 3

Your goal is to show how the volume of a square-based pyramid is related to the volume of a cube.

Your task:

1. Compare the base of the cube with the base of the pyramid. What do you notice?

2. Compare the height of the cube to the height of the pyramid. What do you notice?

3. How many times do you think you would be able to fill the pyramid with water and pour it into the cube before it overflows? Fill in the blanks below. Fill in the bolded components after you perform the experiment.

Guess: __________ **Actual: ____________**

Therefore, the volume of a cube is _____ times greater than the volume of a pyramid.

LETS TRY IT!

i. Fill the pyramid full with water.
ii. Empty the water form the pyramid into the cube.
iii. Repeat until the cube is completely full (keep track of how many times it takes).

4. From your findings, come up with a formula for the volume of a pyramid using the volume of a cube as a base.

7.11.3: Shapes to Go! (Continued)

STATION 4

Imagine a steaming hot summers day and you run into the house after a long bike ride. You rush to the kitchen and open the cupboard to see only two glasses remaining. One is tall and thin and the other is short and wide. You are so relieved because, thanks to your math classes, you are confident that you can choose the glass that holds the most amount of juice.

1. Take a look at the glasses at your station. Which glass would you choose to quench your thirst? Using what you have learned about the volume of 3-D objects, justify your choice.

LETS EXPERIMENT!

i. Fill the taller glass to the top with water.
ii. Transfer the water from the taller glass to the shorter glass.

Are you surprised at what you see?

2. Using the measurement device provided, calculate the volume of both the tall and short glasses.

3. Compare your height and radius measurements of the glasses.
   a) What do you notice?

   b) Does height or radius have a greater effect on the volume of a cylinder? Why? (HINT- Refer to the volume formula for a cylinder)

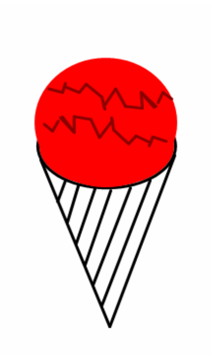
4. Most people would say that the volume of the taller glass exceeds the volume of the shorter glass. Why might they have this perception?

7.11.4: Two Shapes Are Better Than One

Solve **two** of the following three problems. Please show all of your work.

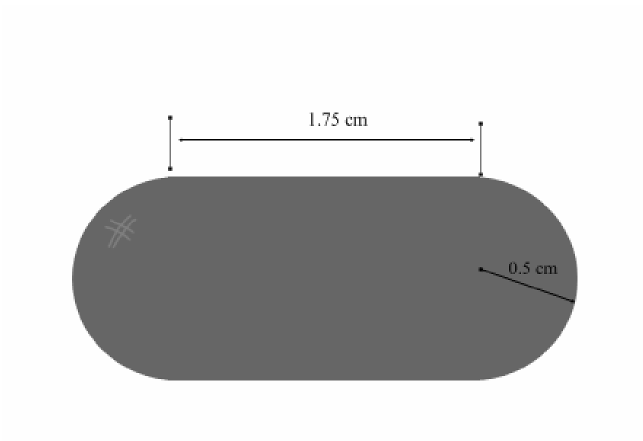
Problem 1

Determine the volume of ice-cream if the diameter of the scoop is 10 cm and the height of the cone is 20 cm. What possible assumptions are made when solving this problem?



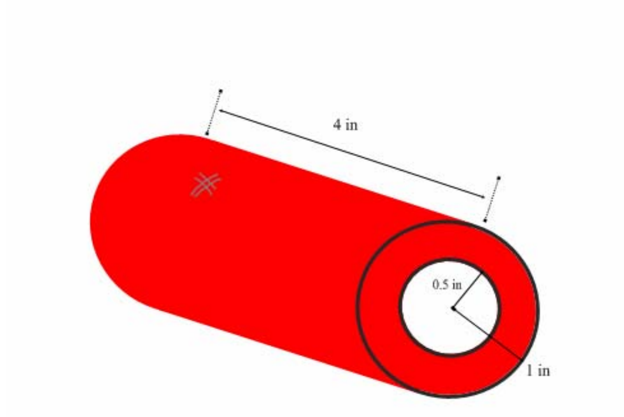
Problem 2

Determine the volume of medicine that will fill the following capsule. What possible assumptions are made when solving this problem?



Problem 3

Determine the volume of cake that is surrounding the cream filling.



7.11.5: Mega Mind Map!

Comparing Concepts- Volume & Area

Concept 1: <u>Volume</u>

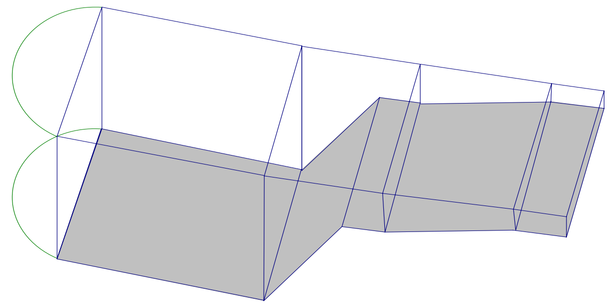
Concept 2: <u>Area</u>

How are they *alike*?

How are they *different*?

7.12.1: Pumping Up the Volume

Solving problems dealing with three-dimensional objects is similar to pulling a puzzle apart; pieces need to be thought of separately. The following swimming pool problem illustrates this.

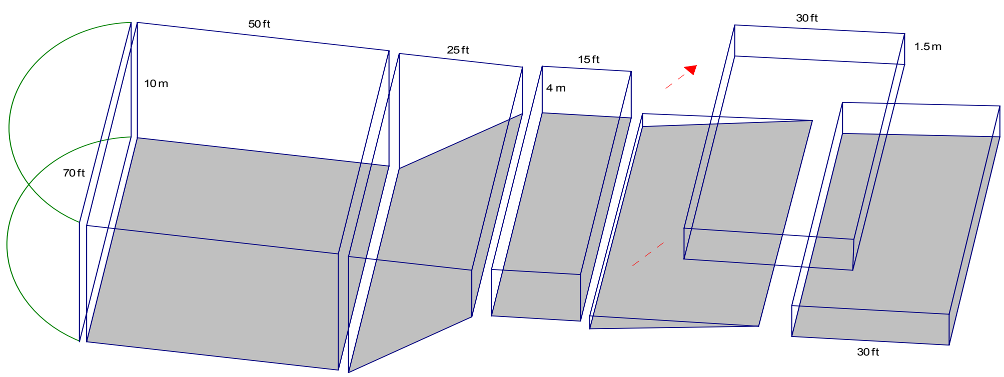


Part A: Pool Volume

Determine the volume of water, in cubic feet, needed to fill the above municipal swimming pool.

<u>Steps</u>

1. Break up your three-dimensional object into the basic objects; such as cylinders, rectangular and triangular prisms etc. This will make determining the volume of these objects much simpler.



2. One method of breaking up the object is shown above. The pool has been broken into seven objects. How many other ways could you break up the pool?

3. Label each section of the pool shown in step 1 above with the letters A, B, C, D, E, F and G, and identify the geometric shapes.

A: ______________ B:_______________ C:________________ D:________________

E: ______________ F:_______________ G:________________

4. The problem asks you to determine the volume in cubic feet. Are there any lengths that need to be converted? If so, convert them.

7.12.1: Pumping Up the Volume (Continued)

5. Calculate the volume for each section. Use the space below to organize your work.

Object A	Object B
Object C	Object D
Object E	Object F
Object G	

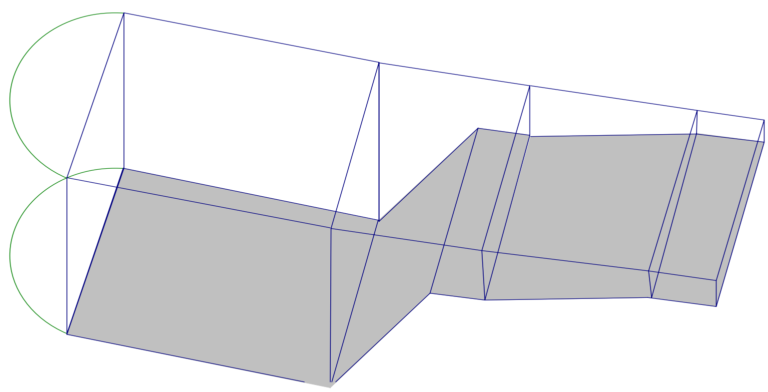
6. Determine the total volume of the swimming pool, in cubic feet.

7.12.2: Pool Management

The building code indicates that when filling swimming pools, there must be a 6-inch gap between the water level and the top of the pool (at ground level). Using your results from '**7.11.1: Pumping Up the Volume',** calculate the volume of water that is needed to fill the pool so that it can meet the building code.

Steps

1. Sketch the volume of the space that will not have water.



2. Label the dimensions needed.

3. Calculate the total volume of water that will be in the pool if the building code is to be followed.

4. The chlorine to water ratio is 130 grams to 10 000L. If chlorine is purchased in 130 gram bags, determine the amount of chlorine that is needed, in kilograms, to chlorinate the pool (1 ft^3 = 28.3168 Litres).

7.13.1: Feeling Isolated

Look at the following equations. Next, look at the steps that are at the bottom of the page. You need to put the steps under the correct equation, in the correct order. The steps should be listed in such a way that you would be able to isolate the variable by following these steps.

Equation: $22 = 3x + 7$	**Equation: $6t - 8 = 34$**
Equation: $m/2 + 6 = 18$	**Equation: $-21 = 3 - 8z$**
Equation: $4k - 5 = -25$	**Equation: $x/4 + 9 = -1$**

Steps

Subtract 3

Add 8

Multiply by 2

Subtract 9

Divide by 4

Divide by 6

Divide by 3

Subtract 7

Subtract 6

Divide by negative 8

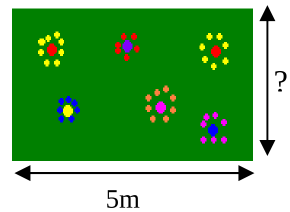
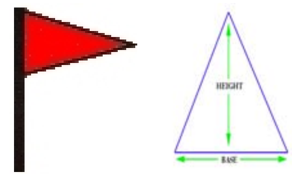
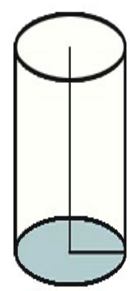
Multiply by 4

Add 5

7.13.2: Solving Measurement Problems

The area of a rectangle is 72 cm^2. The length is 3 cm. What is the width?	The area of a triangle is 32 cm^2. The base of the triangle is 4 cm. What is the height?
Here is the formula for the area of a trapezoid: $A = [(a + b) \times h] \div 2$ If the Area is 19.5 cm^2; a = 7 cm and b = 6 cm, what is the height of the trapezoid?	The volume of a cylinder is given by the formula $V = \pi r^2 h$. If the radius of the cylinder is 8 inches and the volume is 2411.52 in^3, what is the height of the cylinder?
The volume of a rectangular prism is 120 cm^3. The length of the base is 6 cm and the height of the prism is 10 cm. What is the width of the base of the prism?	The Volume of a square-based pyramid is given by the formula ⅓(l x w) x h [where l is the length of the square base, w is the width of the square base and h is the height of pyramid]. If the base has a side length of 6 cm, and the volume is 396 cm^3, what is the height?

7.13.3: Don't Feel Isolated

Role	Audience	Format	Topic
Landscape Architect	Customer	Mrs. Rose wants a rectangular shaped garden planted off the back of her house. She can only afford to plant flowers in an area of $15m^2$. She really wants the garden to be 5m in length. How far from the house will the garden stick out?	Rectangle 
School Sports Team Manager	School Council	You are designing a flag for the upcoming Football Game. Tradition says that the flag must be triangular. The base of the flag has to be 15 inches and you only have enough material to cover an area of 150 square inches. What will be the height of the flag according to these restrictions?	Triangle 
Packaging Designer	Candy Manufacturer	A brand new sugary treat has been invented. The volume of one candy is 1.6 cm^3 and its radius is 1 cm. How long would you need the cylindrical package of candy to be if you need 20 candies to fit in one tube?	Cylinder 
Carpenter	Contractor	An entertainment unit needs to be built for a new home. The cabinet has to have a volume of 1.01 m^3 so it can hold the TV and stereo that the owners recent purchased. In order to fit the space provided, both the height and length of the unit have to be1.2 m. How far will the unit stick out from the wall when complete?	Rectangular Prism 

7.W: Definition Page

Term	Picture / Sketch / Examples	Definition
Imperial Measurement		
Metric Measurement		
Conversion Factor		
Perimeter		
Area		
Composite Shape		
3D Solid		
Volume		
Net		
Surface Area		

7.W: Definition Page (Continued)

Term	Picture / Sketch / Examples	Definition
Pyramid		
Slant Height		
Prism		
Rectangular Prism		
Triangular Prism		
Cylinder		
Cone		

7.S: Unit Summary Page

Unit Name: ____

Using a graphic organizer of your choice create a unit summary.

7.R: Reflecting on My Learning (3, 2, 1)

3 Things I know well from this unit
2 Things I need explained more
1 Question I still have

7.RLS: Reflecting on Learning Skills

Students should be aware of the importance that these skills have on your performance. After receiving your marked assessment, answer the following questions. Be honest with yourself. Good Learning Skills will help you now, in other courses and in the future.

- E – Always
- G – Sometimes
- S – Need Improvement
- N – Never

Organization
- E G S N I came prepared for class with all materials
- E G S N My work is submitted on time
- E G S N I keep my notebook organized.

Work Habits
- E G S N I attempt all of my homework
- E G S N I use my class time efficiently
- E G S N I limit my talking to the math topic on hand
- E G S N I am on time
- E G S N If I am away, I ask someone what I missed,
- E G S N I complete the work from the day that I missed.

Team Work
- E G S N I am an active participant in pairs/group work
- E G S N I co-operate with others within my group
- E G S N I respect the opinions of others

Initiative
- E G S N I participate in class discussion/lessons
- E G S N When I have difficulty I seek extra help
- E G S N After I resolve my difficulties, I reattempt the problem
- E G S N I review the daily lesson/ideas/concepts

Works Independently
- E G S N I attempt the work on my own
- E G S N I try before seeking help
- E G S N If I have difficulties I ask others but I stay on task
- E G S N I am committed to tasks at hand

Yes No I know all the different ways available in my school, where I can seek extra help.

Yes No I tried my best.

What will I do differently in the next unit to improve?

____